### Standards Council Meeting

**SUPPLEMENTAL AGENDA**

August 2 (Noon) 3-5, 2010  
NFPA Headquarters  
1 Batterymarch Park  
Quincy, MA 02169  
617-770-3000

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>10-8-1</strong></td>
<td>Act on the issuance of NFPA 70, <em>National Electrical Code</em>, with an issuance date of August 5, 2010 and an effective date of August 25, 2010, as acted on at the Association Meeting, with amendments as follows:</td>
</tr>
</tbody>
</table>
| **10-8-1-a** | Amendment No. 70-1 (CAM 70-1): Reject an identifiable part of Comment 1-101. The rejection of the identifiable part results in the rejection of the last 5 words of the accepted text in the third paragraph of 110.14(A) in Comment 1-101 as follows:  
    
    Connectors and terminals for conductors more finely stranded than Class B and Class C stranding as shown in Chapter 9, Table 10 shall be identified for the specific conductor class or classes and the number of strands.  
  
  *(Passed Panel ballot, Passed TCC ballot)*  |
| **10-8-1-b** | Appeal of P. Keleher, Paul Keleher Electrical Services requesting that the Council overturn the Association action, and accept an identifiable part of Proposal 2-193. The acceptance of the identifiable part results in accepting the following new text:  
    
    **210.19(A) Branch Circuits Not More than 600 Volts.**  
    **(5) Permissible Voltage Drop.** The circuit conductors of a 15 or 20-ampere/120-volt branch circuit shall be sized such that voltage-drop measured at the rated ampacity of the circuit shall be 5% or less at any outlet.  
  
  This motion (CAM 70-3) failed on the floor of the Association Meeting. See Attachment 10-8-1-b  |
| **10-8-1-c** | Appeal of M. Flegel, Reliance Controls requesting that the Council overturn the Association action, and accept Comment 3-69. This motion (CAM 70-6) failed on the floor of the Association meeting. See Attachment 10-8-1-c  |
| **10-8-1-d** | Amendment No. 70-2 (CAM 70-5): Reject Comment 3-22. *(Failed Panel ballot, Failed TCC ballot)* See Attachment 10-8-1-d  
  
  See Supplemental Attachment 10-8-1-d  |
| **10-8-1-e** | Appeal of C. Turner, Generac Power Systems requesting that the Council grant an extension to the implementation date described in the new requirement to Article 590.6 from January 2, 2011 to January 1, 2012 so that the manufacturers can redesign their products to comply with the new requirement to Article 590.6. See Attachment 10-8-1-e  |
| **10-8-1-f** | Appeal of C. Compagnone, Jr., CompaCovers requesting that the Council overturn  |

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<p>| Appeal | the Association action, and accept Comment 9-26. This motion (CAM 70-12) failed on the floor of the Association Meeting. See Attachment 10-8-1-f See Supplemental Attachment 10-8-1-f |
| 10-8-1-f-1 | Comment received on the appeal filed by C. Compagnone to overturn the Association action, and accept Comment 9-26 (CAM 70-12). See Attachment 10-8-1-f-1 |
| 10-8-1-g | Amendment No. 70-3 (CAM 70-16): Return a portion of a Report in the form of a Proposal 11-107a and related Comments 11-43a, 11-44, 11-45, 11-46 and 11-47. (Passed Panel ballot, Passed TCC ballot) See Attachment 10-8-1-g |
| 10-8-1-h | Amendment No. 70-4 (CAM 70-17): Accept as Modified by Panel for Comment 13-96. (Passed Panel ballot, Passed TCC ballot) See Attachment 10-8-1-h See Supplemental Attachment 10-8-1-h |
| 10-8-1-i | Amendment No. 70-5 (CAM 70-20): Reject Comment 15-101. (Failed Panel ballot, Failed TCC ballot) See Attachment 10-8-1-i See Supplemental Attachment 10-8-1-i |
| 10-8-1-i-1 | Appeal of D. Mercier, Southwire Company requesting that the Council overturn the Association action, and accept Comment 15-101. This motion (CAM 70-20) passed on the floor of the Association Meeting. (Failed Panel ballot, Failed TCC ballot) See Attachment 10-8-1-i-1 |
| 10-8-1-i-1-a | Three comments received on the appeal filed by D. Mercier to overturn the Association action, and accept Comment 15-101. See Supplemental Attachment 10-8-1-i-1-a |
| 10-8-1-j | Amendment No. 70-6 (CAM 70-22): Accept Comment 17-86. (Failed Panel ballot, Failed TCC ballot) See Attachment 10-8-1-j See Supplemental Attachment 10-8-1-j |
| 10-8-1-j-1 | Appeal of W. Robinson, Lothian, MD requesting that the Council uphold floor action and accept Comment 17-86. This motion (CAM 70-22) passed on the floor of the Association Meeting. (Failed Panel ballot, Failed TCC ballot) See Attachment 10-8-1-j-1 See Supplemental Attachment 10-8-1-j-1 |
| 10-8-1-j-1-a | Six comments received on the appeal filed by W. Robinson to uphold floor action, and accept Comment 17-86 (CAM 70-22). See Attachment 10-8-1-j-1-a See Supplemental Attachment 10-8-1-j-1-a |
| 10-8-1-k | Appeal of M. Haag and T. Schaupp, Kaco New Energy requesting that the Council remove Article 690.11 from the proposed 2011 edition of NFPA 70 or to modify it to allow for a future effective-date that awaits the availability of a relevant standard and accounts for a reasonable time frame thereafter for the industry to develop a robust and commercially viable solution. See Attachment 10-8-1-k |
| 10-8-1-l | Appeal of J. Krehnke, SMA Solar Technology America, LLC requesting that the Council remove Article 690.11 from the proposed 2011 edition of NFPA 70 or issue a modification to the original Proposal 4-205 that allows for a future effective date that awaits the availability of a relevant UL standard and accounts for a reasonable time frame thereafter to allow the industry to develop a robust and commercially viable solution. See Attachment 10-8-1-l |
| 10-8-1-k/l | One comment received on the appeals filed by M. Haag and J. Krehnke requesting the Council remove Article 690.11 from the proposed 2011 edition of NFPA 70 or issue a modification to Proposal 4-205. See Supplemental Attachment 10-8-1-k/l |
| 10-8-2-a Appeal | Appeal of M. Greiner, Hazard Control Technologies, Inc. requesting that the Council overturn the Association action, and reject an identifiable part of Comment 18-4. This motion (CAM 18-1) failed on the floor of the Association meeting. See Attachment 10-8-2-a. |
| 10-8-2-a-1 | Three comments received on the appeal filed by M. Greiner requesting that the Council overturn the Association action, and reject an identifiable part of Comment 18-4. See Supplemental Attachment 10-8-2-a-1 |
| 10-8-3 | Act on the issuance of NFPA 25, <em>Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems</em>, with an issuance date of August 5, 2010 and an effective date of August 25, 2010, as acted on at the Association Meeting, with amendments as follows: |
| 10-8-3-a | Amendment No. 25-1(CAM 25-11): Accept Comment 25-41. (Failed ballot) See Attachment 10-8-3-a See Supplemental Attachment 10-8-3-a |
| 10-8-3-a-1 Appeal | Appeal of R. Ray, Cybor Fire Protection Company requesting that the Council uphold the Association action, and accept Comment 25-41. This motion (CAM 25-11) passed on the floor of the Association meeting. (Failed ballot) See Attachment 10-8-3-a-1 |
| 10-8-3-b | Amendment No. 25-2(CAM 25-15): Accept Comment 25-104. (Passed ballot) See Attachment 10-8-3-b See Supplemental Attachment 10-8-3-b |
| 10-8-3-b-1 Appeal | Appeal of R. Fleming, National Fire Sprinkler Association, requesting that the Council uphold the Association action, and accept Comment 25-104. This motion (CAM 25-15) passed on the floor of the Association meeting. (Passed ballot) See Attachment 10-8-3-b-1 |
| 10-8-3-c | Amendment No. 25-3(CAM 25-19): Accept Comment 25-101. (Failed ballot) See Attachment 10-8-3-c See Supplemental Attachment 10-8-3-c |
| 10-8-3-c-1 Appeal | Appeal of L. Larrimer, US Department of Veterans Affairs requesting that the Council uphold the Association action, and accept comment 25-101. This motion (CAM 25-19) passed on the floor of the Association meeting. (Failed ballot) See Attachment 10-8-3-c-1 |
| 10-8-3-d Appeal | Appeal of J. Elvove, U.S. General Services Administration requesting that the Council overturn the Association action, and accept Comment 25-11. This motion (CAM 25-4) failed on the floor of the Association meeting. See Attachment 10-8-3-d |
| 10-8-3-e Appeal | Appeal of J. Elvove, U.S. General Services Administration requesting that the Council overturn the Association action, and accept Comment 25-24. This motion (CAM 25-7) failed on the floor of the Association meeting. See Attachment 10-8-3-e See Supplemental Attachment 10-8-3-e |</p>
<table>
<thead>
<tr>
<th>Item</th>
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<tbody>
<tr>
<td>10-8-3-f Appeal</td>
<td>Appeal of R. Ray, Cybor Fire Protection Company requesting that the Council overturn the Association action, and reject Comments 25-68, 25-70, 25-71, and 25-72. This motion (CAM 25-13) failed on the floor of the Association meeting. See Attachment 10-8-3-f</td>
</tr>
<tr>
<td>10-8-5-a Appeal</td>
<td>Appeal of M. Hirschler, GBH International, requesting that the Council overturn the Association action, and accept motion 53-2 to return the entire report to the committee. This motion (CAM 53-2) failed on the floor of the Association Meeting. See Attachment 10-8-5-a</td>
</tr>
<tr>
<td>10-8-6</td>
<td>Act on the issuance of NFPA 58, <em>Liquefied Petroleum Gas Code</em>, with an issuance date of August 5, 2010 and an effective date of August 25, 2010, as acted on at the Association Meeting, with amendments as follows: <em>(SEE RELATED TIA ITEM 10-8-23)</em></td>
</tr>
<tr>
<td>10-8-6-a</td>
<td>Amendment No. 58-1(CAM 58-3): Accept Comment 58-30. <em>(Passed ballot)</em> See Attachment 10-8-6-a</td>
</tr>
<tr>
<td>10-8-6-b</td>
<td>Amendment No. 58-2(CAM 58-5): Accept Comment 58-49. <em>(Failed ballot)</em> See Attachment 10-8-6-b See Supplemental Attachment 10-8-6-b</td>
</tr>
<tr>
<td>10-8-6-b-1 Appeal</td>
<td>Appeal of M. Gomez, US Chemical Safety and Hazard Investigation Board, requesting that the Council uphold the Association action, and accept Comment 58-49. This motion (CAM 58-5) passed on the floor of the Association Meeting. <em>(Failed ballot)</em> See Attachment 10-8-6-b-1</td>
</tr>
<tr>
<td>10-8-6-b-1-a</td>
<td>Two comments received on the appeal filed by M. Gomez to uphold the Association action, and accept Comment 58-49 See Attachment 10-8-6-b-1-a See Supplemental Attachment 10-8-6-b-1-a</td>
</tr>
<tr>
<td>10-8-6-c</td>
<td>Amendment No. 58-3(CAM 58-7): Accept a modified motion to Proposal 58-154. The modified motion deleted the following sentence from Proposal 58-154: This requirement shall apply to all new installations and to all existing installations within one year of adoption of this code. <em>(Passed ballot)</em> See Attachment 10-8-6-c</td>
</tr>
<tr>
<td>10-8-7</td>
<td>Act on the issuance of NFPA 86, <em>Standard for Ovens and Furnaces</em>, with an issuance date of August 5, 2010 and an effective date of August 25, 2010, as acted on at the Association Meeting, without amendments. <em>(SEE RELATED TIA ITEMS 10-8-26 and 10-8-27)</em></td>
</tr>
<tr>
<td>10-8-7-a Appeal</td>
<td>Appeal of M. Hirschler, GBH International, requesting that the Council overturn the Association action, and accept Comment 86-5. This motion (CAM 86-1) failed on the floor of the Association Meeting. See Attachment 10-8-7-a</td>
</tr>
<tr>
<td>10-8-7-a-1</td>
<td>Five comments received on the appeal filed by M. Hirschler to overturn the Association action, and accept Comment 86-5 (CAM 86-1). See Attachment 10-8-7-a-1  See Supplemental Attachment 10-8-7-a-1</td>
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<td>10-8-9</td>
<td>Act on the issuance of NFPA 204, <em>Standard for Smoke and Heat Venting</em>, with an issuance date of August 5, 2010 and an effective date of August 25, 2010, as acted on at the Association Meeting, with amendments as follows:</td>
</tr>
<tr>
<td>10-8-9-a</td>
<td>Amendment No. 204-1(CAM 204-1): Reject Comment 204-8. Acceptance of this motion was followed by an accepted motion to return the document to the responsible TC for further study. <em>(Passed)</em> ballot on return of document  See Attachment 10-8-9-a</td>
</tr>
<tr>
<td>10-8-9-a-1</td>
<td>Informational ballot results from the Committee on the return revision cycle of the document. See Supplemental Attachment 10-8-9-a-1</td>
</tr>
<tr>
<td>10-8-10-a</td>
<td>Appeal of M. Hirschler, GBH International, requesting that the Council overturn the Association action, and reject Comment 214-1. This motion (CAM 214-1) failed on the floor of the Association Meeting. See Attachment 10-8-10-a</td>
</tr>
<tr>
<td>10-8-12</td>
<td>Act on the issuance of NFPA 502, <em>Standard for Road Tunnels, Bridges, and Other Limited Access Highways</em>, with an issuance date of August 5, 2010 and an effective date of August 25, 2010, as acted on at the Association Meeting, with amendments as follows:</td>
</tr>
<tr>
<td>10-8-12-a</td>
<td>Amendment No. 502-1(CAM 502-8): Accept Comment 502-45. <em>(Passed)</em> ballot  See Attachment 10-8-12-a</td>
</tr>
<tr>
<td>10-8-13</td>
<td>Act on the issuance of NFPA 654, <em>Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids</em>, with an issuance date of August 5, 2010 and an effective date of August 25, 2010, as acted on at the Association Meeting, with amendments as follows:</td>
</tr>
<tr>
<td>10-8-13-a-1</td>
<td>Informational ballot results from the Committee on the return revision cycle of the document. See Supplemental Attachment 10-8-13-a-1</td>
</tr>
<tr>
<td>10-8-13-a-2</td>
<td>Appeal of W. Frank, Frank Risk Solutions, Inc., requesting that the Council overturn the Association action to return the entire report). This motion (CAM 654-9) passed on the floor of the Association Meeting. <em>(Failed)</em> ballot on return of</td>
</tr>
<tr>
<td>Date</td>
<td>Appeal</td>
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<td>10-8-13-a-3</td>
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<td>10-8-13-a-4</td>
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<tr>
<td>10-8-13-a-5</td>
<td>Appeal</td>
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<tr>
<td>10-8-13-a-5-1</td>
<td>One comment received on the appeal filed by B. Chastain requesting that the Council uphold the Association action to return the entire report. See Supplemental Attachment 10-8-13-a-5-1</td>
</tr>
<tr>
<td>10-8-13-a-6</td>
<td>Appeal</td>
</tr>
<tr>
<td>10-8-13-a-6-1</td>
<td>One comment received on the appeal filed by S. Francis requesting that the Council uphold the Association action to return the entire report. See Supplemental Attachment 10-8-13-a-6-1</td>
</tr>
<tr>
<td>10-8-13-a-7</td>
<td>Appeal</td>
</tr>
<tr>
<td>10-8-13-a-7-1</td>
<td>One comment received on the appeal filed by J. Cholin requesting that the Council uphold the Association action to return the entire report. See Supplemental Attachment 10-8-13-a-7-1</td>
</tr>
<tr>
<td>10-8-13-b</td>
<td>Appeal</td>
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<tr>
<td>10-8-13-b-1</td>
<td>Appeal</td>
</tr>
<tr>
<td>10-8-13-b-1-a</td>
<td>One comment received on the appeal filed by J. Cholin requesting that the Council uphold the Association action to return the entire report. See Supplemental Attachment 10-8-13-b-c-d-e-1-a</td>
</tr>
<tr>
<td>10-8-13-c</td>
<td>Appeal</td>
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<td>10-8-13-c-1-a</td>
<td>Appeal</td>
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<td>10-8-13-c-1-b</td>
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<tr>
<td>10-8-13-d</td>
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<td>10-8-13-e</td>
<td>Appeal</td>
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<tr>
<td>10-8-13-d/e</td>
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<tr>
<td>10-8-14</td>
<td>The 2010 Revision Cycle Consent Documents were letter balloted by the Council with an issuance date of June 1, 2010 and an effective date of June 21, 2010, as shown below: No action is necessary</td>
</tr>
<tr>
<td>30B</td>
<td>Code for the Manufacture and Storage of Aerosol Products</td>
</tr>
<tr>
<td>33</td>
<td>Standard for the Spray Application Using Flammable or Combustible Materials</td>
</tr>
<tr>
<td>34</td>
<td>Standard for Dipping and Coating Processes Using Flammable or Combustible Liquids</td>
</tr>
<tr>
<td>40</td>
<td>Standard for the Storage and Handling of Cellulose Nitrate Film</td>
</tr>
<tr>
<td>73</td>
<td>Electrical Inspection Code for Existing Dwellings</td>
</tr>
<tr>
<td>87</td>
<td>Recommended Practice for Fluid Heaters (New)</td>
</tr>
<tr>
<td>88A</td>
<td>Standard for Parking Structures</td>
</tr>
<tr>
<td>160</td>
<td>Standard for the Use of Flame Effects Before an Audience</td>
</tr>
<tr>
<td>307</td>
<td>Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves</td>
</tr>
<tr>
<td>312</td>
<td>Standard for Fire Protection of Vessels During Construction, Conversion, Repair, and Lay-Up</td>
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<tr>
<td>No.</td>
<td>Description</td>
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<tr>
<td>556</td>
<td>Guide on Methods for Evaluating Fire Hazard to Occupants of Passenger Road Vehicles (New)</td>
</tr>
<tr>
<td>780</td>
<td>Standard for the Installation of Lightning Protection Systems</td>
</tr>
<tr>
<td>1000</td>
<td>Standard for Fire Service Professional Qualifications Accreditation and Certification Systems</td>
</tr>
<tr>
<td>1071</td>
<td>Standard for Emergency Vehicle Technician Professional Qualifications</td>
</tr>
<tr>
<td>1126</td>
<td>Standard for the Use of Pyrotechnics Before a Proximate Audience</td>
</tr>
<tr>
<td>1145</td>
<td>Guide for the Use of Class A Foams in Manual Structural Fire Fighting</td>
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</tbody>
</table>

The following documents received Certified Amending Motions but CAMS were not pursued by their submitters, therefore, they become consent documents. These documents have an issuance date of July 2, 2010 and effective date of July 22, 2010.

| 276 | Standard Method of Fire Tests for Determining the Heat Release Rate of Roofing Assemblies with Combustible Above-Deck Roofing Components |
| 409 | Standard on Aircraft Hangars |
| 505 | Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations |

**10-8-15**

Act on the issuance of a proposed Tentative Interim Amendment (TIA) to 7.6.1, of the 2010 edition of NFPA 13, *Standard for the Installation of Sprinkler Systems*, (TIA No. 998). Comment closing date was July 23, 2010. See Supplemental Attachment 10-8-15

**10-8-15-a**

Text of proposed TIA No. 998. See Attachment 10-8-15-a

**10-8-15-b**

Ballot results of proposed TIA No. 998. **Passed** TC ballot on both emergency nature and technical merit. **Passed** TCC ballot on emergency nature and **Failed** on correlation issues. See Attachment 10-8-15-b See Supplemental Attachment 10-8-15-b

**10-8-15-c**

Four comments have been received on proposed TIA No. 998. See Supplemental Attachment 10-8-15-c See Supplemental Attachment 10-8-15-d

**10-8-15-d**

Presentation by S. Wolin, Code Consultants on fire test data for sprinkler systems with various antifreeze concentrations. This presentation will be related to the total of six Tentative Interim Amendments proposed to NFPA 13, NFPA 13D, and NFPA 13R. See Attachment 10-8-15-d

**10-8-16**

Act on the issuance of a proposed Tentative Interim Amendment (TIA) to 7.6.1, of the 2010 edition of NFPA 13, *Standard for the Installation of Sprinkler Systems*, (TIA No. 1000). Comment closing date was July 23, 2010.

**10-8-16-a**

Text of proposed TIA No. 1000. See Attachment 10-8-16-a

**10-8-16-b**

Ballot results of proposed TIA No. 1000. **Passed** TC ballot on emergency nature and **Failed** TC on technical merit. **Passed** TCC ballot on emergency nature and **Failed** on correlation issues. See Attachment 10-8-16-b See Supplemental Attachment 10-8-16-b

**10-8-16-c**

Three comments have been received on proposed TIA No. 1000. See
<table>
<thead>
<tr>
<th>Reference</th>
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<tbody>
<tr>
<td>Supp. 10-8-16-d</td>
<td>Appeal of D. Hague, Liberty Mutual, requesting that the Council issue the proposed TIA to NFPA 13 (TIA No. 1000) No Attachment</td>
</tr>
<tr>
<td>10-8-17</td>
<td>Act on the issuance of a proposed Tentative Interim Amendment (TIA) to 4.1.4, 8.3.3, and Table 8.3.3.2.3 of the 2010 edition of NFPA 13D, Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes, (TIA No. 996). Comment closing date was July 23, 2010.</td>
</tr>
<tr>
<td>10-8-17-a</td>
<td>Text of proposed TIA No. 996. See Attachment 10-8-17-a</td>
</tr>
<tr>
<td>10-8-17-b</td>
<td>Ballot results of proposed TIA No. 996. Passed TC ballot on emergency nature, Failed TC on technical merit. Passed TCC ballot on emergency nature and Failed on correlation issues. See Attachment 10-8-17-b See Supplemental Attachment 10-8-17-b</td>
</tr>
<tr>
<td>10-8-17-c</td>
<td>Five comments have been received on proposed TIA No. 996. See Supplemental Attachment 10-8-17-c</td>
</tr>
<tr>
<td>10-8-17-d</td>
<td>Appeal of K. Isman, NFSA, requesting that the Council issue the proposed TIA to NFPA 13D (TIA No. 996) No Attachment</td>
</tr>
<tr>
<td>10-8-18</td>
<td>Act on the issuance of a proposed Tentative Interim Amendment (TIA) to 3.3.9.1, 4.1.4, 5.2.7, and 8.3.3 of the 2010 edition of NFPA 13D, Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes, (TIA No. 994). Comment closing date was July 23, 2010.</td>
</tr>
<tr>
<td>10-8-18-a</td>
<td>Text of proposed TIA No. 994. See Attachment 10-8-18-a</td>
</tr>
<tr>
<td>10-8-18-b</td>
<td>Ballot results of proposed TIA No. 994. Passed TC ballot on emergency nature and Failed technical merit. Passed TCC ballot on emergency nature and Failed on correlation issues. See Attachment 10-8-18-b See Supplemental Attachment 10-8-18-b</td>
</tr>
<tr>
<td>10-8-18-c</td>
<td>Five comments have been received on proposed TIA No. 994. See Attachment 10-8-18-c See Supplemental Attachment 10-8-18-c</td>
</tr>
<tr>
<td>10-8-18-d</td>
<td>Appeal of M. Pilette, Mechanical Designs Ltd., requesting that the Council issue the proposed TIA to NFPA 13D (TIA No. 994). No Attachment</td>
</tr>
<tr>
<td>10-8-19</td>
<td>Act on the issuance of a proposed Tentative Interim Amendment (TIA) to 4.7 and 5.4.3 of the 2010 edition of NFPA 13R, Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height, (TIA No. 995). Comment closing date was July 23, 2010.</td>
</tr>
<tr>
<td>10-8-19-a</td>
<td>Text of proposed TIA No. 995. See Attachment 10-8-19-a</td>
</tr>
<tr>
<td>10-8-19-b</td>
<td>Ballot results of proposed TIA No. 995. Passed TC ballot on emergency nature, Failed technical merit. Passed TCC ballot on emergency nature and Failed on correlation issues. See Attachment 10-8-19-b See Supplemental Attachment 10-8-19-b</td>
</tr>
<tr>
<td>10-8-19-c</td>
<td>Three comments have been received on proposed TIA No. 995. See Supplemental Attachment 10-8-19-c</td>
</tr>
<tr>
<td>10-8-19-d</td>
<td>Appeal of M. Pilette, Mechanical Designs Ltd., requesting that the Council issue the proposed TIA to NFPA 13R (TIA No. 995). No Attachment</td>
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| 10-8-20         | Act on the issuance of a proposed Tentative Interim Amendment (TIA) to 4.7 of
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<thead>
<tr>
<th>Date</th>
<th>Item</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>10-8-20-a</td>
<td>Text of proposed TIA No. 997. See Attachment 10-8-20-a</td>
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</tr>
<tr>
<td>10-8-20-b</td>
<td>Ballot results of proposed TIA No. 997. <strong>Passed</strong> TC ballot on emergency nature, <strong>Failed</strong> technical merit. <strong>Passed</strong> TCC ballot on emergency nature and <strong>Failed</strong> on correlation issues. See Attachment 10-8-20-b See Supplemental Attachment 10-8-20-b</td>
<td></td>
</tr>
<tr>
<td>10-8-20-c</td>
<td>Five comments have been received on proposed TIA No. 997. See Supplemental Attachment 10-8-20-c</td>
<td></td>
</tr>
<tr>
<td>10-8-20-d</td>
<td>Appeal of K. Isman, NFSA, requesting that the Council issue the proposed TIA to NFPA 13R (TIA No. 997) No Attachment</td>
<td></td>
</tr>
<tr>
<td><strong>10-8-21</strong></td>
<td>Act on the issuance of a proposed Tentative Interim Amendment (TIA) to 3.3.x Alcohol Blended Motor Fuel, 6.2.3, and Table B.1 of the 2008 edition of NFPA 30A, <em>Code for Motor Fuel Dispensing Facilities and Repair Garages</em>, (TIA No. 985). Comment closing date was June 18, 2010.</td>
<td></td>
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<tr>
<td>10-8-21-a</td>
<td>Text of proposed TIA No. 985. See Attachment 10-8-21-a</td>
<td></td>
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<tr>
<td>10-8-21-b</td>
<td>Ballot results of proposed TIA No. 985. <strong>Failed</strong> TC ballot on both technical merit and emergency nature. See Attachment 10-8-21-b</td>
<td></td>
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<tr>
<td>10-8-21-c</td>
<td>Three comments were received on proposed TIA No. 985. See Attachment 10-8-21-c</td>
<td></td>
</tr>
<tr>
<td><strong>10-8-22</strong></td>
<td>Act on the issuance of a proposed Tentative Interim Amendment (TIA) to 8.3 of the 2009 edition of NFPA 54, <em>National Fuel Gas Code</em>, (TIA No. 984R). Comment closing date was July 16, 2010. See related Agenda Item 10-8-38</td>
<td></td>
</tr>
<tr>
<td>10-8-22-a</td>
<td>Text of proposed TIA No. 984R. See Attachment 10-8-22-a</td>
<td></td>
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<tr>
<td>10-8-22-b</td>
<td>Ballot results of proposed TIA No. 984R. <strong>Passed</strong> TC ballot on both technical merit and emergency nature. See Attachment 10-8-22-b See Supplemental Attachment 10-8-22-b</td>
<td></td>
</tr>
<tr>
<td>10-8-22-c</td>
<td>Five comments were received on proposed TIA No. 984R. See Attachment 10-8-22-c See Supplemental Attachment 10-8-22-c</td>
<td></td>
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<tr>
<td><strong>10-8-23</strong></td>
<td>Act on the issuance of a proposed Tentative Interim Amendment (TIA) to 5.2.1.11, 6.6.6, A.6.6.6 and 14.3.1.4 of the proposed 2011 edition of NFPA 58, <em>Liquefied Petroleum Gas Code</em>, (TIA No. 986). Comment closing date was May 14, 2010.</td>
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<tr>
<td>10-8-23-a</td>
<td>Text of proposed TIA No. 986. See Attachment 10-8-23-a</td>
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<tr>
<td>10-8-23-b</td>
<td>Ballot results of proposed TIA No. 986. <strong>Passed</strong> TC ballot on both technical merit and emergency nature. See Attachment 10-8-23-b</td>
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<tr>
<td>10-8-23-c</td>
<td>No comments were received on proposed TIA No. 986. No Attachment</td>
<td></td>
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<tr>
<td><strong>10-8-24</strong></td>
<td>Act on the issuance of a proposed Tentative Interim Amendment (TIA) to 90.2(B)(5)(b) of the 2008 edition of NFPA 70, <em>National Electrical Code</em>, (TIA No. 990). Comment closing date was June 18, 2010.</td>
<td></td>
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<tr>
<td>10-8-24-a</td>
<td>Text of proposed TIA No. 990. See Attachment 10-8-24-a</td>
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<tr>
<td>10-8-24-b</td>
<td>Ballot results of proposed TIA No. 990. <strong>Passed</strong> TCC ballot on correlation issues</td>
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<tr>
<td>Date</td>
<td>Description</td>
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</tr>
<tr>
<td>10-8-24-c</td>
<td>One comment was received on proposed TIA No. 990. See Attachment 10-8-24-c</td>
<td></td>
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<tr>
<td>10-8-25-a</td>
<td>Text of proposed TIA No. 989. See Attachment 10-8-25-a</td>
<td></td>
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<tr>
<td>10-8-25-b</td>
<td>Ballot results of proposed TIA No. 989. <strong>Failed</strong> TC ballot on both technical merit and emergency nature. <strong>Failed</strong> TCC ballot on both correlation issues and emergency nature. See Attachment 10-8-25-b</td>
<td></td>
</tr>
<tr>
<td>10-8-25-c</td>
<td>One comment was received on proposed TIA No. 989. See Attachment 10-8-25-c</td>
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</tr>
<tr>
<td>10-8-26</td>
<td>Act on the issuance of proposed Tentative Interim Amendment (TIA) to 7.4.10.2 of the proposed 2011 edition of NFPA 86, <em>Standard on Ovens and Furnaces</em>, (TIA No. 987). Comment closing date was May 14, 2010.</td>
<td></td>
</tr>
<tr>
<td>10-8-26-a</td>
<td>Text of proposed TIA No. 987. See Attachment 10-8-26-a</td>
<td></td>
</tr>
<tr>
<td>10-8-26-b</td>
<td>Ballot results of proposed TIA No. 987. <strong>Passed</strong> TC ballot on both technical merit and emergency nature. See Attachment 10-8-26-b</td>
<td></td>
</tr>
<tr>
<td>10-8-26-c</td>
<td>No comments were received on proposed TIA No. 987. No Attachment</td>
<td></td>
</tr>
<tr>
<td>10-8-27</td>
<td>Act on the issuance of proposed Tentative Interim Amendment (TIA) to 14.5.1.7.4 and A.14.5.1.7.4 of the proposed 2011 edition of NFPA 86, <em>Standard on Ovens and Furnaces</em>, (TIA No. 988). Comment closing date was May 14, 2010.</td>
<td></td>
</tr>
<tr>
<td>10-8-27-a</td>
<td>Text of proposed TIA No. 988. See Attachment 10-8-27-a</td>
<td></td>
</tr>
<tr>
<td>10-8-27-b</td>
<td>Ballot results of proposed TIA No. 988. <strong>Passed</strong> Committee ballot on both technical merit and emergency nature. See Attachment 10-8-27-b</td>
<td></td>
</tr>
<tr>
<td>10-8-27-c</td>
<td>No comments were received on proposed TIA No. 988. No Attachment</td>
<td></td>
</tr>
<tr>
<td>10-8-28-a</td>
<td>Text of proposed TIA No. 982. See Attachment 10-8-28-a</td>
<td></td>
</tr>
<tr>
<td>10-8-28-b</td>
<td>Ballot results of proposed TIA No. 982. <strong>Passed</strong> TC ballot on technical merit and <strong>Failed</strong> on emergency nature. See Attachment 10-8-28-b</td>
<td></td>
</tr>
<tr>
<td>10-8-28-c</td>
<td>No comments were received on TIA No. 982. No Attachment</td>
<td></td>
</tr>
<tr>
<td>10-8-28-d</td>
<td>Appeal of G. Pecht, Senior Flexonics, requesting that the Council issue the proposed TIA to NFPA 850 (TIA No. 982). See Attachment 10-8-28-d</td>
<td></td>
</tr>
<tr>
<td>10-8-29</td>
<td>Consider the request of the Technical Correlating Committee on Automatic Sprinkler Systems to revise the scopes for the Technical Committee on Sprinkler Systems Installation (AUT-SSI) and the Technical Committee on Sprinkler System Discharge (AUT-SSD) by transferring the responsibilities for Chapter 22 and Chapter 23.</td>
<td></td>
</tr>
</tbody>
</table>

**AUT-SSD Current Scope:** This Committee shall have primary responsibility for those portions of NFPA 13 that pertain to the
classification of various fire hazards and the determination of associated discharge criteria for sprinkler systems employing automatic and open sprinklers.

**AUT-SSD Proposed Scope:** This Committee shall have primary responsibility for those portions of NFPA 13 that pertain to the classification of various fire hazards and the determination of associated discharge criteria for sprinkler systems employing automatic and open sprinklers, sprinkler system plans and calculations, and water supplies.

**AUT-SSI Current Scope:** This Committee shall have the primary responsibility for those portions of NFPA 13 that pertain to the criteria for the use and installation of sprinkler systems components (with the exception of those components used for supporting of piping), position of sprinklers, types of systems, plans and calculations, water supplies, and acceptance testing.

**AUT-SSI Proposed Scope:** This Committee shall have the primary responsibility for those portions of NFPA 13 that pertain to the criteria for the use and installation of sprinkler systems components (with the exception of those components used for supporting of piping), position of sprinklers, types of systems, plans and calculations, water supplies, and acceptance testing.

See Attachment 10-8-29

| 10-8-30 | Consider the request of the Technical Committee (TC) on Fire Service Training to have NFPA establish a new document on fire service training on thermal imaging. At the March 2010 Standards Council Meeting the Council directed that the TC on Fire Service Training and the TC on Electronic Safety work together to come to a joint decision on how best to address the issue of fire service training on thermal imagers. The TC on Fire Service Training and the TC on Electronic Safety are reporting back to the Council with a decision that a Task Group composed of members from both TCs produce a draft document and then the Fire Service Training Committee will assume primary responsibility for the management of the document. They propose the scope of the document be as follows:

**Proposed Committee Scope:** This standard shall contain minimum requirements for training fire service personnel in the selection, operation, care, use and maintenance of thermal imagers.

See Attachment 10-8-30  See Supplemental Attachment 10-8-30

| 10-8-31 | At the March, 2010 Standards Council Meeting, the Council considered the request of the International Association of Fire Chiefs to have establish a new project on organization and deployment of fire investigation operations, code enforcement operations and public education operations to the public by career
fire department. Action on this item was deferred from the August 2009, administratively withdrawn from the October 2009 Agenda, and deferred to the March 2010 meeting while additional information was being sought. The Council voted to publish a notice of receipt of the request soliciting opinions on the need for the document, information on resources available on the subject matter, those interested in participating if approved, and other organizations that may be actively involved with the subject matter. Sixty-one responses were received which consisted of support for the proposed project and volunteering to become members of the Committee when formed.

**Proposed Committee Title:** Fire Prevention Organization and Deployment

**Proposed Committee Scope:** This Committee shall have primary responsibility for documents on the organization, operation, deployment, and evaluation of code enforcement, public fire and life safety education, and fire investigation operations.

See Attachment 10-8-31 and related Agenda Item 10-8-47-b See Supplemental Attachment 10-8-31

| 10-8-32 | At its March 2010, meeting the Council considered the request of D. Forsman, Chief, Champaign Fire Department, Champaign, Illinois, that NFPA consider the establishment of a new proposed technical committee and document on professional qualifications for emergency responders working on roadways. This request was administratively withdrawn from the October 2009 Agenda and deferred to the March 2010 meeting while additional information was being sought. After review of all the information before them, the Council voted to publish a notice of receipt of the request soliciting opinions on the need for the document, information on resources available on the subject matter, those interested in participating if approved, and other organizations that may be actively involved with the subject matter. Forty-four responses were received which consisted of support for the proposed project and volunteering to become members of the Committee when formed. 

If established the proposed document scope and title will be:

**Proposed Committee Title:** Traffic Control Incident Management Professional Qualifications

**Proposed Committee Scope:** This standard identifies the minimum job performance requirements (JPRs) necessary to perform temporary traffic control duties at emergency incidents on, or near an active roadway.

See Attachment 10-8-32 and Related Agenda Item 10-8-47-a See Supplemental Attachment 10-8-32

| 10-8-33 | Consider the request of the Technical Committee (TC) on Special Operations Protective Clothing and Equipment for a new document on Contaminated Water Operations Protective Clothing and Equipment. At the March 2009 Standards Council Meeting the Council directed the TC to review its membership and make any membership recommendations necessary to assure that the TC has |
appropriate contaminated water expertise. The TC is now reporting back to the Council showing that the TC now has the expertise to write the new document. See Attachment 10-8-33 See Supplemental Attachment 10-8-33

| 10-8-34 | At its March, 2010 meeting, the Council considered the request of the Technical Committee on Hazardous Materials Response Personnel, that NFPA consider the establishment of a new recommended practice on minimum requirements for the organization and management of hazardous materials/weapons of mass destruction (WMD) emergency response program. After review of all the information before them, the Council voted to publish a notice of receipt of the request soliciting opinions on the need for the document, information on resources available on the subject matter, those interested in participating if approved, and other organizations that may be actively involved with the subject matter. Five responses were received which consisted of support for the proposed project when formed. If established the proposed document scope will be:

**Proposed Document Scope:** This recommended practice establishes a common set of criteria for the organization, management, and deployment of personnel, resources, and programs for those public or private entities that are responsible for the hazardous materials/weapons of mass destruction emergency preparedness function.  
See Attachment 10-8-34 See Supplemental Attachment 10-8-34 |

| 10-8-35 | At the March 2010 meeting, the Council considered the request of S. Pitts, Marine Corps Systems Command, that NFPA consider the establishment of a new proposed document on power air purifying respirator (PAPR). Action on this item was deferred from the August 2009 meeting. This request was administratively withdrawn from the October 2009 Agenda and deferred to the March 2010 meeting while clarifying information was being sought. After review of all the information before them, the Council voted to publish a notice of receipt of the request soliciting opinions on the need for the document, information on resources available on the subject matter, those interested in participating if approved, and other organizations that may be actively involved with the subject matter. Six responses were received which mostly consisted of support for the proposed project if formed. If established the proposed document could report to the Technical Committee on Respiratory Protection Equipment and the scope will be:

**Proposed Document Scope:** Specify minimum requirements for the design, performance, testing, NIOSH certification, and independent third-party certification for high air flow powered air purifying respirators (PAPRs) for emergency services operations at incidents involving chemical warfare agents, toxic industrial chemicals/toxic industrial materials, biological warfare agents, and radioactive particulates.  
See Attachment 10-8-35 See Supplemental Attachment 10-8-35 |
<p>| 10-8-36 | At the March 2010 meeting, the Council acted on a request from NFPA staff on the possibility of combining the four combustible dust committees and five documents they are responsible for into one committee and document. The Council voted to publish a notice regarding this combination and solicit comments from committee members and the public. The comment period has passed and the responses are included as well as a memo from the NFPA staff. See Attachment 10-8-36 See Supplemental Attachment 10-8-36 |
| 10-8-37 | Consider the request of the Chair of the NEC Technical Correlating Committee (TCC) and the Chair of the Electrical Safety in the Workplace that the Council consider the effective date of the 2010 edition of NFPA 70E not become effective until 180 days from the date of issuance by the Standards Council. See Attachment 10-8-37 |
| 10-8-38 | Consider the request from NFPA Staff to establish a new Committee and Document on Gas Process Safety. This Committee shall be responsible for defining safe practices associated with gas process safety that would include the various practices related to use of gaseous media to clean, purge, or charge gas piping. See Attachment 10-8-38 and related Agenda Item 10-8-22 |
| 10-8-40 | Consider the request of the Technical Committee on Fire Department Apparatus for a one time revision cycle change for NFPA 1906, <em>Standard for Wildland Fire Apparatus</em> to move from F2010 to F2011. This document will not reopen for new proposals. See Attachment 10-8-40 |
| 10-8-41 | Consider the request of the Technical Committee on Fire Service Occupational Safety and Health for a one time revision cycle change for the following documents: NFPA 1583, <em>Standard on Health-Related Fitness Programs for Fire Department Members</em>; and NFPA 1584, <em>Standard on Health-Related Fitness Programs for Fire Department Members</em> to move from A2014 to F2014. See Attachment 10-8-41 |
| 10-8-42 | Consider the request of the Technical Committee on Fire Service Training for a one time revision cycle change for NFPA 1451, <em>Standard for a Fire Service Vehicle Operations Training Program</em> from F2011 to F2012. See Attachment 10-8-42 |</p>
<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
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<tbody>
<tr>
<td>10-8-44</td>
<td>Consider the request of the Technical Committee Static Electricity for a one time revision cycle change for NFPA 77, <em>Recommended Practice on Static Electricity</em> to move from A2011 to F2012. See Attachment 10-8-44</td>
</tr>
<tr>
<td>10-8-45</td>
<td>Consider the request of the Technical Committee on Structural and Proximity Fire Fighting Protective Clothing for a one time revision cycle change for NFPA 1851, <em>Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting</em> to move from A2012 to F2012. The Committee is also requesting that the proposal closing date be November 30, 2010. See Attachment 10-8-45</td>
</tr>
<tr>
<td>10-8-46</td>
<td>Policy and Procedures Task Group (S. Clary, Chair). See Supplemental Attachment 10-8-46</td>
</tr>
<tr>
<td>10-8-47</td>
<td>Report of the Membership Task Group (K. Bell, Chair).</td>
</tr>
<tr>
<td>10-8-47-a</td>
<td>Committee Membership. See Attachment 10-8-47-a See Supplemental Attachment 10-8-47-a</td>
</tr>
<tr>
<td>10-8-47-b</td>
<td>Start-up Roster and Scope of proposed Committee on Fire Prevention Organization and Deployment <strong>Proposed Committee Scope:</strong> This Committee shall have primary responsibility for documents on the organization, operation, deployment, and evaluation of code enforcement, public fire and life safety education, and fire investigation operations. See Attachment 10-8-47-b</td>
</tr>
<tr>
<td>10-8-47-c</td>
<td>Start-up Roster of Committee on Fluid Heaters. See Attachment 10-8-47-c</td>
</tr>
<tr>
<td>10-8-48</td>
<td>Report on the Minutes of March 2010. No Attachment</td>
</tr>
<tr>
<td>10-8-49</td>
<td>Dates and places of upcoming meetings:</td>
</tr>
<tr>
<td>August 2 (noon Task Group)</td>
<td>Full Council August 3-5, 2010</td>
</tr>
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<td>Quincy, MA</td>
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<tr>
<td>Full Council October 19-20, 2010 (Task Group 8AM on Oct 19)</td>
<td>February 28 (noon Task Group)</td>
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<td>March 1-2</td>
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<td>San Antonio, TX</td>
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<td>San Juan, PR</td>
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<tr>
<td>10-8-50</td>
<td>Consider the request of the Committee on Respiratory Protection Equipment for</td>
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</tbody>
</table>

| **10-8-51** | Consider the request of the Committee on Electronic Safety Equipment for a one time revision cycle change for NFPA 1982, *Standard on Personal Alert Safety Systems (PASS)* to move from F2011 to F2012. See Supplemental Attachment 10-8-51 ADDITION |
Item 10-8-5
Amy Beasley Cronin  
NFPA, Secretary Standards Council  
1 Battery March Park  
Quincy, MA, 02169  

Date: June 23, 2010  

Dear Amy:  

I hereby want to appeal to Standards Council against the membership vote opposing NITMAM 53-2, which was a motion to return NFPA 53, Recommended Practice on Materials, Equipment, and Systems Used in Oxygen-Enriched Atmospheres, to committee. The reason that I believe that Standards Council should not approve a “new” edition of NFPA 53 is that this technical committee is “working the NFPA system” in order not to revise a document that has not changed since 1994. The proposed “new” edition is unchanged in any way from the previous edition. The statements in the ROC about the committee’s intent to make changes and develop into a standard conflict with the testimony on the floor at the NFPA June 2010 meeting where the committee members (and the chair) stated that they just want a repository of information contained in various annexes while the standard that they actually use has been issued by another standards development organization.  

If the technical committee was earnest in desiring to convert the recommended practice into a standard, the revisions I proposed in comments 53-1 through 53-6 would have provided the basis for them accomplishing that objective, without changing requirements. The fact that all comments were rejected summarily without any action indicates that this technical committee is not actually using the NFPA process for document revision.  

It is inappropriate for a technical committee to abuse the NFPA process just so that they can claim to have an NFPA consensus document instead of just an authored publication or report.  

Yours sincerely  

______________________________  
Marcelo M. Hirschler
Revise chapter 2 to convert it into mandatory language so that this document can become a standard.

2.1 General.

The documents or portions thereof listed in this chapter are referenced within this recommended practice and should be considered part of the recommendations of this document.

The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

Substantiation: The proponent is correct that the document needs to become a standard. I have developed comments to proposal 53-2 for revising chapters 2 and 5 through 8, which are the only ones that require such revision. The key difference between a recommended practice and a standard is that everything is written in mandatory language. With these changes the recommended practice can become a standard and can be used more widely.

I am the chair of the NFPA Advisory Committee on the Glossary of Terminology.

Committee Meeting Action: Reject

Committee Statement: The committee feels that moving towards a standard is a good idea, but it is considered to be too difficult at this time due to limited resources available to the committee at the time of this Fall 2009 Revision Cycle. The contingent of members that work on this committee are currently unable to put in the necessary effort to convert the Practice to a Standard. The Technical Committee believes that upgrading to a standard is feasible and desirable from a technical standpoint, but to make this conversion prematurely and without due cause will result in a standard that will possibly pose great difficulty to some users of the document. The committee will continue to explore this option, but do not foresee its release for this revision cycle. Between this time and the next revision cycle, the Technical Committee will continue to garner support and feedback from other oxygen-enriched atmosphere experts, such as manufacturers and suppliers in this field, in a continued effort to go from a recommended practice to a standard.

Number Eligible to Vote: 8
Ballot Results: Affirmative: 6
Ballot Not Returned: 2 Colson, A., Samant, A.
NFPA 53

53-1 Log #2

Final Action: Reject

Submitter: Marcelo M. Hirschler, GBH International
Comment on Proposal No: 53-2
Recommendation: Revise the title to make this recommended practice into a standard.

Recommended Practice on Standard for the Selection of Materials, Equipment, and Systems for Use Used in Oxygen-Enriched Atmospheres

Substantiation: The proponent is correct that the document needs to become a standard. It is of interest that the committee held this recommendation from the previous cycle, which resulted in the issuance of the 2004 edition of the document. If this is not acted upon now (for the 2010 edition), the users will have to wait another 6 years. The time to act is now.

In separate comments, I have developed language for revising chapters 2 and 5 through 8, which are the only ones that require such revision so that a standard can be issued. The key difference between a recommended practice and a standard is that everything is written in mandatory language. With these changes the recommended practice can become a standard and can be used more widely.

I am the chair of the NFPA Advisory Committee on the Glossary of Terminology.

Committee Meeting Action: Reject
Committee Statement: The committee feels that moving towards a standard is a good idea, but it is considered to be too difficult at this time due to limited resources available to the committee at the time of this Fall 2009 Revision Cycle. The contingent of members that work on this committee are currently unable to put in the necessary effort to convert the Practice to a Standard. The Technical Committee believes that upgrading to a standard is feasible and desirable from a technical standpoint, but to make this conversion prematurely and without due cause will result in a standard that will possibly pose great difficulty to some users of the document. The committee will continue to explore this option, but do not foresee its release for this revision cycle. Between this time and the next revision cycle, the Technical Committee will continue to garner support and feedback from other oxygen-enriched atmosphere experts, such as manufacturers and suppliers in this field, in a continued effort to go from a recommended practice to a standard.

Number Eligible to Vote: 8
Ballot Results: Affirmative: 6
Ballot Not Returned: 2 Colson, A., Samant, A.
Report on Proposals – November 2009

53-2 Log #1

(Entire Document)

Final Action: Reject

Note: This proposal appeared as Comment 53-1 (Log #1) which was held from the November 2003 ROC on Proposal 53-1.

Submitter: Craig H. Kampmier, Swansea, MA


Substantiation: The document recognizes hazards and acceptable practices to minimize the risk of unacceptable outcomes. The recommended practice should be editorially revised as a standard to provide for the enforceable protection of life and property in conjunction with materials, practices and procedures in oxygen-enriched atmospheres. As a recommended practice the safety and fire protection or inspection community and society are absent of a recognized enforceable safety standard regarding oxygen-enriched atmospheres. The existing document substantiates the hazards and compatible materials. Failure to recognize, accept or apply this information and guidance can be catastrophic, as documented in the appendix (annex) material. As such the recommended practice should be made mandatory and enforceable by editorially revising the document as a standard.

Committee Meeting Action: Reject

Committee Statement: The committee feels that moving towards a standard is a good idea, but it is considered to be too difficult at this time due to limited resources available to the committee at the time of this Fall 2009 Revision Cycle. The contingent of members that work on this committee are currently unable to put in the necessary effort to convert the Practice to a Standard. The Technical Committee believes that upgrading to a standard is feasible and desirable from a technical standpoint, but to make this conversion prematurely and without due consideration will result in a standard that will possibly pose great difficulty to some users of the document. The committee will continue to explore this option, but do not foresee its release for this revision cycle.

Number Eligible to Vote: 7

Ballot Results: Affirmative: 5

Ballot Not Returned: 2 Barry, R., Samant, A.
SHANE CLARY: Thank you.

All opposed, same sign.

(Raising Hands.)

SHANE CLARY: And the motion fails.

Next we're moving to sequence 53-2.

And Microphone No. 5.

MARCELO HIRSCHLER: Marcelo Hirschler, GBH International, speaking for myself. I move 53-2 return to committee.

SHANE CLARY: We have a second? Do we have a second?

(Second.)

SHANE CLARY: We do have a second. Please proceed.

MARCELO HIRSCHLER: Marcelo Hirschler, GBH International. It's interesting that the arguments that were given for not making it a standard are the arguments that there are other documents that are better, okay?

There are other documents that are better, then we should demand from the committee after it's been 16 years doing nothing that it spend some time doing something and incorporate the other documents since -- I think it's the least that an NFPA should do.

Perhaps what they should do is withdraw it.
They can't have it both ways. The document is perfect, but it's useless because it conflicts with other documents.

And please return the document to committee and have them make some change after 16 years.

SHANE CLARY: Okay. Thank you.

Mr. Stoltzfus.

JOEL STOLTZFUS: The document is good as a recommended practice, it's useful. To switch it from a "should statement" to a "shall statement" would be very damaging and conflict with other standards that have already been written.

SHANE CLARY: Okay. Thank you.

That will open up the floor for debate, and it looks like Microphone No. 4.

BARRY NEWTON: Yes, Mr. Chairman. My name is Barry Newton. I am speaking in opposition to this motion. NFPA 53 it's been said is not very useful, and those of us in the oxygen practicing world who -- and I've been dealing with oxygen systems since the early '90s, this document is one of the most respected documents of all that we use.

We have -- within ASTM and my company, WHA, we've trained literally thousands of people in the safe use of oxygen systems, and we use this document every
single class we teach. It's an extremely useful
document, and it forms an effective way of teaching the
basic principles of oxygen system safety and those
things that good practice would demand should be
considered. So to say that it hasn't changed or is not
very useful is just incorrect.

Now, the committee also got me involved under
this specific question to see if we could find a way to
harmonize this document as it stands with the other
industry best practices that cover such a wide range of
industries.

A wide cross-section -- in fact, the largest
cross-section of oxygen users and practitioners that I
know of came together from ASTM, CGA, Compressed Gas
Association, the European Industrial Gas Association,
NASA, Navy, military, we came together to consider this
question. And while it's a question worth considering,
we found that there was no way to harmonize the current
provisions in this document directly with all of the
industry best practices across the board.

One example is the statements that were made to
change the -- the "should statements" or should be
considered to "shall" as related to materials. The
statement was changed that you should avoid or you shall
avoid aluminum wherever possible. Well, just that
1 single statement would put the industry into a turmoil.
2 The vast majority of aircraft that are flying use aluminum lines. The vast majority of hospital ventilators at low pressure use aluminum manifolds.
3 There are millions of oxygen cylinders that are made out of aluminum that are used every day and used safely. And so it really does depend on the application, and the industry best practices right now exist to address each of the hazards of those certain situations.
4 Now, this document is -- is brief in its text as it relates to the -- those practices as it relates to the text that should be changed to a standardized wording. Now, this document as it stands is useful and would have to change entirely in order to be changed into a standard. It would have to be changed substantially and completely reformatted and its current usefulness would be lost.
5 So in my judgment, what the industry needs is this standard as it stands and the industry best practices that are codified elsewhere fit the needs for our industry. And so as a task group, we chose to go that direction at the current time and the way this currently stands as opposed to try to completely fundamentally change the document.
6 SHANE CLARY: Thank you.
Microphone No. 5, please.

MARCELO HIRSCHLER: Marcelo Hirschler, GBH International, for the motion. Just to read the section that the gentleman just referred to, although it's a moot point because changing the standard is -- that is already not on the table.

But the current text is the use of aluminum alloys and lines (indiscernible) how the component should be avoided whenever possible. My recommended change was avoid the use of aluminum alloys and lines, valves, and other components whenever possible.

There's no change in meaning. One says it should be done whenever possible or one says do it whenever possible. It means the same thing. The point is that the committee doesn't want to do anything (indiscernible) 16 years continues to say they don't do anything.

This document needs to go somewhere else because we are in the business of creating living documents, not dead document. This is a document that hasn't changed in 16 years. Send it back for them to do something, please.

SHANE CLARY: Thank you.

Mr. Stoltzfus, any concluding comments?

JOEL STOLTZFUS: Yeah. I'm not going to say...
anything. I don't want to respond emotionally. I am done.

SHANE CLARY: Okay. Thank you.

At that we'll proceed with the motion which is to return the entire report to the committee.

All in favor of the motion, signify by raising your hand.

(Raising Hands.)

SHANE CLARY: Thank you.

And all opposed, same sign.

(Raising Hands.)

SHANE CLARY: The motion fails.

Mr. Stoltzfus, thank you.

JOEL STOLTZFUS: Okay. Now, is it time to leave?

SHANE CLARY: You may now. It's Miller time. The next report under consideration this afternoon is that of the technical committee on any ovens and furnaces.

Here to present the committee's report is committee chair Richard Gallagher of Zurich Services Corporation in Wilmington, Delaware.

The committee report can be found in the blue 2010 annual revision cycle, ROP and ROC. The certified amending motions are contained in the motions committee
Item 10-8-6
ASSOCIATION AMENDMENT
BALLOT RESULTS

DATE: July 9, 2010

AMENDMENT


Motion: To Accept Comment 58-30

TC FINAL Ballot Results

According to 4.7.1 in the NFPA Regs (RGCP), the final results show this Amendment **HAS** achieved the necessary \( \frac{2}{3} \) majority vote needed to recommend approval of the Association Action by the Technical Committee.

The number of affirmative votes needed for the report to be published is **18**.

\[
[28 \text{ (eligible to vote)} - 2 \text{ (not returned)} - 0 \text{ (abstentions)} = 26 \times 0.66 = 17.16]
\]

In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required.

\[
[28 \text{ eligible} ÷ 2 = 14 + 1 = 15 \text{ (this is the simple majority)}]
\]

**28 Eligible to Vote**

**2 Not Returned (Garza-Obregon, Volgstadt)**

- 20 Agree
- 6 Do Not Agree (King, McTier, Misel, Mortimer, Raj, Stannard)
- 0 Abstain

**Final Action: PASS**
Standards Council Supplemental Agenda

August 3-5, 2010

NFPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Comment 58-30)

Amendment: Accept Comment 58-30

☐ Agree

If you agree with this amendment, the result will be to revise text as follows:
3.3.27* Gas (for the purposes of this code): Liquefied petroleum gas in either the liquid or vapor state.
A 3.3.27 The more specific terms liquid LP-Gas or vapor LP-Gas are used for clarity.

☒ Do Not Agree*

If you do not agree with this amendment, the recommendation is to return to previous edition text, or delete the text if no previous edition text exists. The previous edition text reads as follows:
3.3.27 Gas: Liquefied petroleum gas in either the liquid or vapor state. The more specific terms liquid LP-Gas or vapor LP-Gas are used for clarity.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":

The current text is superior to the revision.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 for:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: JOHN KINK

Date: 7/1/2010

June 2010
Standards Council Supplemental Agenda

August 3-5, 2010

Page 823 of 1603

Standards Council Supplemental Agenda

June 2010

NFPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Comment 58-30)

Amendment: Accept Comment 58-30

☐ Agree

☐ Do Not Agree* If you do not agree with this amendment, the recommendation is to return to previous edition text, or delete the text if no previous edition text exists. The previous edition text reads as follows:
3.3.27 Gas. Liquefied petroleum gas in either the liquid or vapor state. The more specific terms liquid LP-Gas or vapor LP-Gas are used for clarity.

☐ Abstain*

*Please give reasons for voting “Do Not Agree” or “Abstain”:
The definition probably is not needed but the old version is more clear than the new recommended version.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeannine Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]
Name - Please Print: Samuel E. McTie
Date: 6/17/2010

June 2010
NFPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Comment 58-30)

Amendment: Accept Comment 58-30

☐ Agree If you agree with this amendment, the result will be to revise text as follows:
3.3.27* Gas (for the purposes of this code), Liquefied petroleum gas in either the liquid or vapor state.
A.3.3.27 The more specific terms liquid LP-Gas or vapor LP-Gas are used for clarity.

☒ Do Not Agree* If you do not agree with this amendment, the recommendation is to return to previous edition text, or
delete the text if no previous edition text exists. The previous edition text reads as follows:
3.3.27 Gas. Liquefied petroleum gas in either the liquid or vapor state. The more specific terms liquid
LP-Gas or vapor LP-Gas are used for clarity.

☐ Abstain*

*Please give reasons for voting “Do Not Agree” or “Abstain”:

The text adds nothing to the code

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: [Name]

Date: [Date]

June 2010
Jeanne, please change my vote to "do not agree" on amendment 58-30. The changes made do not add to clarification of the definition.

Thanks!

Frank

FRANK J. MORTIMER
EMC INSURANCE COMPANIES
RISK IMPROVEMENT DEPARTMENT
FIELD SERVICES SUPERVISOR
(515) 345-2127

NOTICE: This message (including any attachments) is intended for a specific individual and may contain information that is either confidential or legally protected. If you believe that it has been sent to you in error, please reply to the sender that you have received the message in error, then delete it. If you are not the intended recipient, you are hereby notified that any retention, dissemination, distribution, or copying of this communication is strictly prohibited. Thank you. EMC071856
NFPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Comment 58-30)

Amendment: Accept Comment 58-30

[ ] Agree

If you agree with this amendment, the result will be to revise text as follows:
3.3.27 Gas (for the purposes of this code). Liquefied petroleum gas in either the liquid or vapor state.
A.3.3.27 The more specific terms liquid LP-Gas or vapor LP-Gas are used for clarity.

[×] Do Not Agree*

If you do not agree with this amendment, the recommendation is to return to previous edition text, or
delete the text if no previous edition text exists. The previous edition text reads as follows:
3.3.27 Gas. Liquefied petroleum gas in either the liquid or vapor state. The more specific terms liquid
LP-Gas or vapor LP-Gas are used for clarity.

[ ] Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":
This amendment does not add any additional clarification to an already confusing definition of a
gas. How can a "gas" be defined as a "liquefied" petroleum gas in either the liquid or vapor state.
This definition may need to be revisited during the next revision to the document. No need to
further muddle the issue by adding new and confusing language. I also agree with Mr. Stannard's
comments on this issue.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: Phani Raj

Date: 28 June 2010

June 2010
Moreau-Correia, Jeanne

From: Jim Stannard [stannardandcompany@verizon.net]
Sent: Monday, June 28, 2010 1:51 PM
To: Moreau-Correia, Jeanne
Cc: Walker, Nancy; Moreau-Correia, Jeanne; Lemoff, Ted; david.burnell@puc.nh.gov; afossa@mdj.com.br; Cegarza@garob.com; slgentry@worthingtonindustries.com; rahoffmann@hoffmann-feige.com; stanley.kastanas@dot.gov; jwking@fedins.com; glenn.mahnken@fmglobal.com; james.osterhaus@rrc.state.tx.us; tmsinc1981@verizon.net; fvolgs376@aol.com; lesliewoodward@buffalo.fairviewfittings.com; donb@ermat.co.uk; Richard.Gilbert@rrc.state.tx.us; Richard.Gilbert@rrc.state.tx.us; roger.maxon@berzmatic.com; s.younis@comcast.net
Subject: Re: Reminder: NFPA 58 Amendment Ballots - Due Tuesday, June 29, 2010


June 28, 2010

Votes and Comments on
Association Amendments 58-30, 49, and 154

On Amendment 58-30, I vote negatively

COMMENT: This amendment is totally unnecessary and adds nothing to the usefulness of NFPA 58. Even a casual reading of the document makes it clear that the code covers both the liquid and gaseous states of LPG. Anyone attempting to utilize the code that does not comprehend the present language and intent of the code with respect to its applicability to both the gaseous and liquid phases is certainly not qualified to either use or interpret the code.

On Amendment 58-49, I vote negative

COMMENT: This amendment would not add any additional useful requirements to the training of personnel involved in the handling of LPG. On the contrary, it will add unnecessary burdens to the documentation of training that is presently required by NFPA 58. Those additional burdens will be an invitation to maintain less than forthright training records, particularly in the case of the smaller marketers. IN addition, the proposed language does away with the presently required re-training.

On Amendment 58-154, I vote negatively.

COMMENT: I find the proposed amendment does not enhance safety, but on the contrary may actually reduce safety.

James H. Stannard, Jr.
COMMENT 58-30 (A2010) Accept Comment

58-30 Log #40 Final Action: Reject (3.3.27 Gas and A.3.3.27)

Submitter: Glossary of Terms Technical Advisory Committee / Marcelo Hirschler,
Comment on Proposal No: 58-27
Recommendation: 3.3.27* Gas (for the purposes of this code). Liquefied petroleum gas in either the liquid or vapor state. A.3.3.27 the more specific terms liquid LP-Gas or vapor LP-Gas are used for clarity.
Substantiation: The NFPA Technical Advisory Committee on Terminology was formed by Standards Council to ensure consistency in definitions within the NFPA system. Definitions must be in single sentences. Moreover, definitions cannot contain requirements. There is no problem with adding annex notes that explain the concept further. The definition is not a general definition of gas, which is the one that is defined in NFPA 30A. Therefore the qualifier is important. The annex note adds the information previously present.
NFPA 30A defines gas as: "A material that has a vapor pressure greater than 300 kPa absolute (43.5 psia) at 50°C (122°F) or is completely gaseous at 20°C (68°F) at a standard pressure of 101.3 kPa absolute (14.7 psia)"
Committee Meeting Action: Reject
Committee Statement: Refer to proposal 58-27 which revises the definition.
Number Eligible to Vote: 26
Ballot Results: Affirmative: 25
Ballot Not Returned: 1 Garza-Obregon, C.

PROPOSAL 58-27 (A2010) Backup

58-27 Log #CP53 Final Action: Accept (3.3.27 Gas)

Submitter: Technical Committee on Liquefied Petroleum Gases,
Recommendation: Revise 3.3.27 to read: 3.3.27 Gas. Liquefied petroleum gas in either the liquid or vapor state. The more specific terms liquid LP-Gas or vapor LP-Gas are used for clarity.
Substantiation: The definition is revised to delete unneeded text.
Committee Meeting Action: Accept
Number Eligible to Vote: 29
Ballot Results: Affirmative: 27
Ballot Not Returned: 2 Bogosian, Jr., V., Sutton, M.
International, for the Glossary Committee, in support of the motion.

Again, I want to point out that what Mr. Swiecicki is saying is that they want requirements in the definition. That is in contrary to the manual of style. Requirements are not in the definition. Definitions explain things. Requirements go somewhere else. Please support the motion.

MR. JARD: Is there any further discussion from the floor on this motion? Mr. Mortimer, do you have any last comments?

MR. MORTIMER: I believe both sides have been adequately heard.

MR. JARD: Okay. Thank you. With that, we'll move to a vote on the motion. Let me restate the motion on the floor. The motion on the floor is to accept Comment 58-22.

All in favor please raise your hand. Thank you. All opposed please raise your hand. Motion fails.

Okay. With that, let's move on to Motion 58-3. Microphone 5, please.

MR. HIRSCHLER: Marcelo Hirschler, GBH

International for the Glossary of Terms Technical
Advisory Committee. And I move to accept Comment 58-30.

MR. JARD: Okay. Thank you. There's a motion on the floor to accept Comment 58-30. Is there a second? There is a second. Please proceed.

MR. HIRSCHLER: Thank you, Mr. Chairman. Again, this is similar to the previous ones. We're talking here about the definition of gas. Gas is a whole bunch of things. We cannot have a definition of gas that says gas is liquified petroleum gas.

Gas is a generic term. If you want to have a definition of gas that says gas is liquified petroleum gas, then you have to say for the purposes of this particular code because, otherwise, you're going against what every dictionary talks about.

So we have two motions in here. The present one accepts the definition with the explanation adding more specific issues in the annex, or the subsequent motion would just simply add for the purpose of this code. It is against the simple technical basic to say that gas is liquified petroleum gas. It is not.

MR. JARD: All right. Thank you.

Mr. Mortimer, would you like to offer the Committee's position?
MR. MORTIMER: Yes. The Committee looked at the section that this definition is in. And Section 3.1 of this states that the definition contained in this chapter shall apply to the terms in this Code. Since it's already in that section, adding it again for the purposes of this code seemed redundant to the Technical Committee.

MR. JARD: All right. Thank you, Mr. Mortimer. With that, we'll open up debate on the motion. Please remember to state your name and affiliation and whether you're for or opposed to the motion on the floor. Microphone 5.

MR. HIRSCHLER: Marcelo Hirschler, GBH International, for the Glossary Committee, in favor of the motion.

I would need to point out that every NFPA definition doesn't just sit in the document in which it is defined but sits in the entire glossary. So if we don't put the rider in there for the purpose of this code, we have the NFPA stating to the world that gas is liquified petroleum gas. That is nonsense. Please support the motion.

MR. JARD: Microphone 9.

MR. HAGUE: Thank you, Mr. Chairman. David Hague, with Liberty Mutual Properties, speaking in
favor of the motion on the floor.

The comment refers to a proposal that defines gas, as Mr. Hirschler just referenced, as liquified petroleum gas. There are certainly other types of gases.

The chairman also made a statement that for the purposes of this code, that's referred to as the limiting phrase. And believe it or not, there is an ASTM standard on how to write terminology and such a statement as for the purpose of this code, which is called a delimiting phrase, would be appropriate.

So as written, this definition of gas is quite deficient even though for the purpose of NFPA 58, you certainly are talking about liquified petroleum gas. So I urge this membership to support the motion on the floor to try to achieve more consistent terminology in the National Fire Codes.

Thank you.

MR. JARD: Microphone Number 5.

UNIDENTIFIED SPEAKER: Good morning.

(Indiscernible) of the American Society of Anesthesiologists. Mr. Hirschler is right. If you look in the medical area, we have medical gases that are extremely important throughout NFPA 99. To confuse medical gases with liquified petroleum would
be absurd. And I think in order to try to -- this is an important term. Gas is very important in the medical world. It has nothing to do with this particular code. I think we need to have a consistent definition.

MR. JARD: Mr. Mortimer, do you have any further comment?

MR. MORTIMER: Yes. The glossary in which I received indicated not only the definition, but also which code that definition applied to. And I believe the Technical Committee continues to think it's a bit redundant to add something that's already there in the definition section.

MR. JARD: Okay. Thank you. With that, we'll move to a vote on the motion. Restated, the motion on the floor is to accept Comment 58-30. All in favor of the motion, please raise your hand. Thank you. All opposed please raise your hand. The motion carries. With that, let's move on to the next motion, 58-4.

MR. HIRSCHLER: Mr. Chairman, Marcelo Hirschler, GBH International, for the Glossary Committee. I choose not to pursue this motion.

MR. JARD: The Chair accepts the withdrawal of that motion. Thank you. And we'll proceed to the
ASSOCIATION AMENDMENT
BALLOT RESULTS

DATE:    July 9, 2010

AMENDMENT


Motion: To Accept Comment 58-49

TC PRELIMINARY Ballot Results (as of 7/9/10)

According to 4.7.1 in the NFPA Regs (RGCP), the final results show this Amendment IS NOT achieving the necessary \( \frac{2}{3} \) majority vote needed to recommend approval of the Association Action by the Technical Committee.

The number of affirmative votes needed for the report to be published is 16.

\[
[28 \text{ eligible to vote} - 5 \text{ (not returned)} - 0 \text{ (abstentions)} = 23 \times 0.66 = 15.18]
\]

In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required.

\[
[28 \text{ eligible} \div 2 = 14 + 1 = 15 \text{ (this is the simple majority)}]
\]

28 Eligible to Vote

5 Not Returned (Bogan, Garza-Obregon, Kastanas, King, Volgstadt)

14  Agree

9  Do Not Agree  (Fossa, McTier, Misel, Mortimer, Phillippi, Raj, Stainbrook, Stannard, Swiecicki)

0  Abstain

Final Action: FAILING
Moreau-Correia, Jeanne

From: Alberto [afossa@mdj.com.br]
Sent: Saturday, June 26, 2010 8:48 AM
To: Moreau-Correia, Jeanne; Walker, Nancy
Subject: RES: NFPA 58 Amendments

Dear Jeanne,

Please consider my vote as following:

Amendment: Accept Comment 58-30: agree

Amendment: Accept Comment 58-49: Do Not Agree — Reasons: The proposal defines so many particular and specific requirement for people qualification. The actual requirement is clear to consider adequate training program for qualification of personnel.

Amendment: Accept Comment: agree

Regards,
Alberto

De: Moreau-Correia, Jeanne [mailto:jmoreau@nfpa.org]
Enviada em: terça-feira, 15 de junho de 2010 17:22
Para: Walker, Nancy; Moreau-Correia, Jeanne
Assunto: NFPA 58 Amendments

TO: The Technical Committee on Liquefied Petroleum Gases

Dear Committee Members:

Attached are the ballot materials for NFPA 58 Amendments. The due date for return of the ballot is Tuesday, June 29, 2010. Please fax your ballot to 617-984-7110 or email to jmoreau@nfpa.org. (Please note there are three (3) ballots to be returned).

This information has also been posted on your ECommittee Page under the “Ballot Information Heading” and within the “Other Ballots” folder.

If you have any questions, please don’t hesitate to contact me.

Thank you.

Jeanne Moreau
Technical Projects Supervisor
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
Ph: 617-984-7586
FAX: 617-984-7110

Standards Council Supplemental Agenda
August 3-5, 2010
Page 835 of 1603
Revised Page Number 27 of 837
NPPA 58
TC BALLOT for Liquified Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Comment 58-49)

Amendment: Accept Comment 58-49

☐ Agree
If you agree with this amendment, the result will be to revise 4.4.1 to read as follows:
4.4* Qualification of Personnel.
4.4.1 All persons who transfer, transport, or perform other work activities with liquid petroleum gas that
fall within the scope of this standard, shall receive training that includes the following components:
(1) Scope and time frame of the training, consistent with the nature of the trainee's job;
(2) Recognition of the safety and health hazards of work with liquefied petroleum gas;
(3) Safe work practices applicable to the employees' jobs;
(4) Emergency response actions;
(5) Supervised on-the-job training; and,
(6) Testing and performance evaluation.

☒ Do Not Agree*
If you do not agree with this amendment, the recommendation is to return to previous edition text, and
the proposed new text is not added. The existing text reads as follows:
4.4* Qualification of Personnel.
Persons who transfer liquid LP-Gas, who are employed to transport LP-Gas, or whose primary duties
fall within the scope of this code shall be trained in proper handling procedures. Refresher training shall
be provided at least every 3 years. The training shall be documented.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":
The present language is better coverage.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: Samuel E. McTavish
Name - Please Print: Samuel E. McTavish
Date: 6/17/2010

June 2010
NFPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Comment 58-49)

Amendment: Accept Comment 58-49

☐ Agree

If you agree with this amendment, the result will be to revise 4.4.1 to read as follows:
4.4 Qualification of Personnel.
4.4.1 All persons who transfer, transport, or perform other work activities with liquid petroleum gas that
fall within the scope of this standard, shall receive training that includes the following components:
(1) Scope and time frame of the training, consistent with the nature of the trainee’s jobs;
(2) Recognition of the safety and health hazards of work with liquefied petroleum gas;
(3) Safe work practices applicable to the employees’ jobs;
(4) Emergency response actions;
(5) Supervised on-the-job training; and,
(6) Testing and performance evaluation.

☒ Do Not Agree*

If you do not agree with this amendment, the recommendation is to return to previous edition text, and
the proposed new text is not added. The existing text reads as follows:
4.4 Qualification of Personnel.
Persons who transfer liquid LP-Gas, who are employed to transport LP-Gas, or whose primary duties
fall within the scope of this code shall be trained in proper handling procedures. Refresher training shall
be provided at least every 3 years. The training shall be documented.

☐ Abstain*

*Please give reasons for voting “Do Not Agree” or “Abstain”:

I believe the additional verbiage is unnecessary not
necessary

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature:

Name - Please Print: Geoffrey Misud

Date: 6-17-10

June 2010
Standards Council Supplemental Agenda
August 3-5, 2010

NEPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Comment 58-49)

Amendment: Accept Comment 58-49

☐ Agree

If you agree with this amendment, the result will be to revise 4.4.1 to read as follows:

4.4.1 Qualification of Personnel.

4.4.1 All persons who transfer, transport, or perform other work activities with liquid petroleum gas that fall within the scope of this standard, shall receive training that includes the following components:

1. Scope and time frame of the training, consistent with the nature of the trainee's job;
2. Recognition of the safety and health hazards of work with liquefied petroleum gas;
3. Safe work practices applicable to the employee's job;
4. Emergency response actions;
5. Supervised on-the-job training; and,

☒ Do Not Agree* If you do not agree with this amendment, the recommendation is to return to previous edition text, and the proposed new text is not added. The existing text reads as follows:

4.4.1 Qualification of Personnel.

Persons who transfer liquid LP-Gas, who are employed to transport LP-Gas, or whose primary duties fall within the scope of this code shall be trained in proper handling procedures. Refresher training shall be provided at least every 3 years. The training shall be documented.

☐ Abstain*

*Please give reasons for voting “Do Not Agree” or “Abstain”:

Training and documentation are more than enough. Adding a subjective "performance evaluation" for all persons that have duties within the scope of NFPA 58 will open a legal Pandora.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]
Name - Please Print: Frank J. Mortimer
Date: 06-16-2010

June 2010
NFPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Comment 58-49)

Amendment: Accept Comment 58-49

☐ Agree

If you agree with this amendment, the result will be to revise 4.4.1 to read as follows:

4.4* Qualification of Personnel.
4.4.1 All persons who transfer, transport, or perform other work activities with liquid petroleum gas that fall within the scope of this standard, shall receive training that includes the following components:
(1) Scope and time frame of the training, consistent with the nature of the trainee’s jobs;
(2) Recognition of the safety and health hazards of work with liquefied petroleum gas;
(3) Safe work practices applicable to the employees' jobs;
(4) Emergency response actions;
(5) Supervised on-the-job training; and,
(6) Testing and performance evaluation.

☐ Do Not Agree*

If you do not agree with this amendment, the recommendation is to return to previous edition text, and the proposed new text is not added. The existing text reads as follows:

4.4* Qualification of Personnel.
Persons who transfer liquid LP-Gas, who are employed to transport LP-Gas, or whose primary duties fall within the scope of this code shall be trained in proper handling procedures. Refresher training shall be provided at least every 3 years. The training shall be documented.

☐ Abstain*

*Please give reasons for voting “Do Not Agree” or “Abstain”:

[Signature]

[Name - Please Print] [Handwritten Name]

[Date] 23/06/2010

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Handwritten Signature]

Name - Please Print: [Handwritten Name]

Date: 23/06/2010

June 2010
NFPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Comment 58-49)

Amendment: Accept Comment 58-49

☐ Agree

If you agree with this amendment, the result will be to revise 4.4.1 to read as follows:

4.4.1 All persons who transfer, transport, or perform other work activities with liquid petroleum gas that fall within the scope of this standard, shall receive training that includes the following components:
   (1) Scope and time frame of the training, consistent with the nature of the trainee's job;
   (2) Recognition of the safety and health hazards of work with liquefied petroleum gas;
   (3) Safe work practices applicable to the employee's job;
   (4) Emergency response actions;
   (5) Supervised on-the-job training; and,
   (6) Testing and performance evaluation.

☒ Do Not Agree*

If you do not agree with this amendment, the recommendation is to return to previous edition text, and the proposed new text is not added. The existing text reads as follows:

4.4 Qualification of Personnel.

Persons who transfer liquid LP-Gas, who are employed to transport LP-Gas, or whose primary duties fall within the scope of this code shall be trained in proper handling procedures. Refresher training shall be provided at least every 3 years. The training shall be documented.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":

The personnel training requirements, for qualifying LP-Gas handling personnel, is adequately stipulated in section 4.4. In addition there are a number of training systems available in practice and which have been used by the industry to enhance safety (ex. NFPA LP-Gas Code Training, NPGA's LPG Training courses, etc).

Please return as soon as possible, but no later than Tuesday, June 22, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: __________________________

Name - Please Print: Phani Raj

Date: 28 June 2010

June 2010

Standards Council Supplemental Agenda August 3-5, 2010 Page 840 of 1603
NFPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Comment 58-49)

Amendment: Accept Comment 58-49

☐ Agree

If you agree with this amendment, the result will be to revise 4.4.1 to read as follows:
4.4 Qualification of Personnel.
4.4.1 All persons who transfer, transport, or perform other work activities with liquid petroleum gas that fall within the scope of this standard, shall receive training that includes the following components:
(1) Scope and timeframe of the training, consistent with the nature of the trainee's job;
(2) Recognition of the safety and health hazards of work with liquefied petroleum gas;
(3) Safe work practices applicable to the employees' jobs;
(4) Emergency response actions;
(5) Supervised on-the-job training; and,
(6) Testing and performance evaluation.

☒ Do Not Agree*

If you do not agree with this amendment, the recommendation is to return to previous edition text, and the proposed new text is not added. The existing text reads as follows:
4.4 Qualification of Personnel.
Persons who transfer liquid LP-Gas, who are employed to transport LP-Gas, or whose primary duties fall within the scope of this code shall be trained in proper handling procedures. Refresher training shall be provided at least every 3 years. The training shall be documented.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":

I agree with specific requirements called out in comment 58-49; however the requirements for refresher training and documentation of the training have been eliminated. This is a step backward which I cannot support.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: David J. Steinbrook

Date: 6-21-10

June 2010
Moreau-Correia, Jeanne

From: Jim Stannard [stannard@company@verizon.net]
Sent: Monday, June 28, 2010 1:51 PM
To: Moreau-Correia, Jeanne
Cc: Walker, Nancy; Moreau-Correia, Jeanne; Lemoff, Ted; david.burnell@puc.nh.gov;
afozza@mdj.com.br; Cegarza@garob.com; stgentry@worthingtonindustries.com;
rahoffmann@hoffmann-feige.com; stanley.kastanas@dot.gov; jwking@fedins.com;
glenn.mahnken@fmglobal.com; james.osterhaus@rrc.state.tx.us; tmsinc1981@verizon.net;
fvolgst376@aol.com; lesliewoodward@buffalo.fairviewfittings.com; donb@enmat.co.uk;
Richard.Gilbert@rrc.state.tx.us; Richard.Gilbert@rrc.state.tx.us;
roger.maxon@bernzomatic.com; s.younis@comcast.net

Subject: Re: Reminder: NFPA 58 Amendment Ballots - Due Tuesday, June 29, 2010

James H. Stannard, Jr.

June 28, 2010

Votes and Comments on

Association Amendments 58-30, 49, and 154

On Amendment 58-30, I vote negatively

COMMENT: This amendment is totally unnecessary and adds nothing to the usefulness of NFPA 58. Even a casual reading of the document makes it clear that the code covers both the liquid and gaseous states of LPG. Anyone attempting to utilize the code that does not comprehend the present language and intent of the code with respect to its applicability to both the gaseous and liquid phases is certainly not qualified to either use or interpret the code.

On Amendment 58-49, I vote negative

COMMENT: This amendment would not add any additional useful requirements to the training of personnel involved in the handling of LPG. On the contrary, it will add unnecessary burdens to the documentation of training that is presently required by NFPA 58. Those additional burdens will be an invitation to maintain less than forthright training records, particularly in the case of the smaller marketers. IN addition, the proposed language does away with the presently required re-training.

On Amendment 58-154, I vote negatively.

COMMENT: I find the proposed amendment does not enhance safety, but on the contrary may actually reduce safety.

James H. Stannard, Jr.

Standards Council Supplemental Agenda
August 3-5, 2010

Revised Page Number 34 of 837
NFPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Comment 58-49)

Amendment: Accept Comment 58-49

[ ] Agree

If you agree with this amendment, the result will be to revise 4.4.1 to read as follows:
4.4.1 Qualification of Personnel.
4.4.1 All persons who transfer, transport, or perform other work activities with liquid petroleum gas that
fall within the scope of this standard, shall receive training that includes the following components:
(1) Scope and time frame of the training, consistent with the nature of the trainee’s jobs;
(2) Recognition of the safety and health hazards of work with liquefied petroleum gas;
(3) Safe work practices applicable to the employees’ jobs;
(4) Emergency response actions;
(5) Supervised on-the-job training; and
(6) Testing and performance evaluation.

[ ] Do Not Agree*

If you do not agree with this amendment, the recommendation is to return to previous edition text, and
the proposed new text is not added. The existing text reads as follows:
4.4 Qualification of Personnel.
Persons who transfer liquid LP-Gas, who are employed to transport LP-Gas, or whose primary duties
fall within the scope of this code shall be trained in proper handling procedures. Refresher training shall
be provided at least every 3 years. The training shall be documented.

[ ] Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":

[Signature]

Name - Please Print: Bruce Svecich

Date: 6/16/10

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

June 2010
PROPOSAL 58-46 (A2010) Backup

58-46 Log #77 Final Action: Accept in Principle

(4.4)

Submitter: John S. Bresland, U.S. Chemical Safety and Hazard Investigation Board

Recommendation: Revise text to read as follows:

In Liquefied Petroleum Gas Code (NFPA 58), revise the “Qualifications for Personnel” section (4.4), to specify training requirements (including supervised on-the-job training), attaining curricula, competencies, and testing through written examination and performance evaluation, or reference a nationally recognized curriculum for these requirements.

Substantiation: The U.S. Chemical Safety and Hazard Investigation Board (CSB) conducted an investigation of the propane explosion that occurred at the Little General Store in Ghent, West Virginia on January 30, 2007. The CSB published a report on the findings of the investigation, “Little General Store - Propane Explosion” on September 25, 2008. Within the report is a recommendation to the National Fire Protection Association (NFPA). The report can be found at the CSB website (www.csb.gov).

The investigation concluded that the immediate cause of the explosion was a dangerous release of propane that leaked into the store and ignited during a propane transfer from an existing tank to a newly installed replacement tank. A junior propane service technician was preparing to transfer the propane, unsupervised, when he fully removed a plug from a malfunctioned liquid withdrawal valve, releasing propane uncontrollably in the store through overhanging attic vents located above the tank. The release contained for 25 minutes as emergency responders and a senior propane service technician arrived. Soon after, the propane ignited and leveled the store. Two propane service technicians and two emergency responders were killed. Four store employees inside the building as well as two other emergency responders outside the store were injured, some severely.

The investigation revealed that the junior technician’s training was inadequate for performing the task of transferring liquid propane from tank to tank while unsupervised. Further investigation exposed the absence of effective training guidance for propane technicians in both regulatory and voluntary standards. Specifically, NFPA 58, Liquefied Petroleum Gas Code, recommends training for propane industry employees who transport and transfer liquefied petroleum gas and refresher training, but does not clarify what should constitute the initial training. Guidance that provides explicitly training requirements with a curriculum and a testing component would facilitate an enforceable training standard to assist states that have adopted or will adopt NFPA 58.

Committee Meeting Action: Accept in Principle

Add a new A.4.4 to read:

A.4.4 Examples of training programs are:

1. The Certified Employee Training Program developed by the PERC, www.propanecouncil.org
2. Programs developed by propane companies.
3. Programs developed by government entities.

The term refresher indicates that the periodic training could be less intensive than the original training, whose primary purpose is to reinforce initial training rather than repeat it.

Committee Statement: Annex A text is added to provide examples of the types of training that can be used to meet the requirements of Section 4.4

Number Eligible to Vote: 29

Ballot Results: Affirmative: 26 Negative: 1

Ballot Not Returned: 2 Bogosian, Jr., V., Sutton, M.

Explanation of Negative:

PEHLIPPFI, H.: Do not feel this adds value because the phrase “immediate cause of the explosion was a dangerous release” does not go to the root cause of the release which was a failed valve which goes unmentioned/analyzed as a cause.

Comment on Affirmative:

BELKE, J.: The committee action does not sufficiently incorporate the CSB proposal. Adding text to annex A is okay, but by itself will not improve training in the industry or prevent accidents like the Ghent, WV explosion. A specific code requirement is called for.

CZISCHKE, R.: In addition to the new annex text proposed, it is important that training of personnel include how to respond to emergency situations. The following is proposed to be added to 4.4

4.4 Qualification of Personnel. Persons who transfer liquid LP-Gas, who are employed to transport LP-Gas, or whose primary duties fall within the scope of this code shall be trained in proper handling procedures, and how to respond to emergency situations. Refresher training shall be provided at least every 3 years. The training shall be documented.

MCTIER, S.: In the next to last line change “whose” to “where” to avoid the use in this case of the pronoun “whose”.

COMMENT 58-49 (A2010) Accept Comment

58-49 Log #131 Final Action: Reject

(4.4)


Comment on Proposal No: 58-46

Recommendation: Add text to read as follows:

All persons who transfer, transport, or perform other work activities with liquid petroleum gas that fall within the scope of this standard, shall receive training that includes the following components:

- Scope and time frame of the training, consistent with the nature of the trainee’s job;
- Recognition of the safety and health hazards of work with liquefied petroleum gas;
- Safe work practices applicable to the employees’ job;
- Emergency response actions;
- Supervised on-the-job training; and,
- Testing and performance evaluation.

Substantiation: Training requirements are necessary in the body of the standard so that they are enforceable. The suggested requirement language reflects a commonly accepted framework for performance-based training programs (See 29 CFR 1910.119).

Committee Meeting Action: Reject

Committee Statement: The committee affirms its action in the ROP. Training and documentation of training are required by NFPA 58, and most current programs include testing and certification.

Number Eligible to Vote: 26

Ballot Results: Affirmative: 23 Negative: 2

Ballot Not Returned: 1 Garza-Obregon, C.

Explanation of Negative:

BELKE, J.: The mere documentation of attendance at training does not reflect a commonly accepted framework for performance-based training standard so that they are enforceable. The suggested requirement language constitutes the initial training. Guidance that provides explicitly training requirements with a curriculum and a testing component would facilitate an enforceable training standard to assist states that have adopted or will adopt NFPA 58.

Committee Meeting Action: Accept Comment

Manuel R. Gomez, Rep. Recommendations Dept. USCSB
ASSOCIATION AMENDMENT
BALLOT RESULTS

DATE: July 21, 2010

AMENDMENT


Motion: To Accept Comment 58-49

TC FINAL Ballot Results

According to 4.7.1 in the NFPA Regs (RGCP), the final results show this Amendment HAS NOT achieving the necessary \( \frac{2}{3} \) majority vote needed to recommend approval of the Association Action by the Technical Committee.

The number of affirmative votes needed for the report to be published is 17.

\[
28 \text{ (eligible to vote)} - 3 \text{ (not returned)} - 0 \text{ (abstentions)} = 25 \times 0.66 = 16.5
\]

In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required.

\[
28 \text{ eligible} \div 2 = 14 + 1 = 15 \text{ (this is the simple majority)}
\]

28 Eligible to Vote
3 Not Returned (Bogan, Garza-Obregon, Volgstadt)

<table>
<thead>
<tr>
<th>Agree</th>
<th>Do Not Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Agree</td>
<td>15 Do Not Agree</td>
</tr>
</tbody>
</table>

(Raj w/comment)

(Fossa, King, Mahre, McTier, Misel, Mortimer, Osterhaus, Phillippi, Ribbs, Stainbrook, Stannard, Swiecicki, Wilson, Woodward, Young)

0 Abstain

Final Action: FAIL
Moreau-Correia, Jeanne

From: Alberto [afossa@mdj.com.br]
Sent: Saturday, June 26, 2010 8:48 AM
To: Moreau-Correia, Jeanne; Walker, Nancy
Subject: RES: NFPA 58 Amendments

Dear Jeanne,

Please consider my vote as following:

Amendment: Accept Comment 58-30: agree

Amendment: Accept Comment 58-49: Do Not Agree – Reasons: The proposal define so many particular and specific requirement for people qualification. The actual requirement is clear to consider adequate training program for qualification of personnel.

Amendment: Accept Comment: agree

Regards,
Alberto

De: Moreau-Correia, Jeanne [mailto:jmoreau@NFPA.org]
Enviada em: terça-feira, 15 de junho de 2010 17:22
Para: Walker, Nancy; Moreau-Correia, Jeanne
Assunto: NFPA 58 Amendments

TO: The Technical Committee on Liquefied Petroleum Gases

Dear Committee Members:

Attached are the ballot materials for NFPA 58 Amendments. The due date for return of the ballot is Tuesday, June 29, 2010. Please fax your ballot to 617-984-7110 or email to jmoreau-correia@nfpa.org (Please note there are three (3) ballots to be returned).

This information has also been posted on your ECommittee Page under the “Ballot Information Heading” and within the “Other Ballots” folder.

If you have any questions, please don’t hesitate to contact me.

Thank you.

Jeanne Moreau
Technical Projects Supervisor
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
Ph: 617-984-7586
Fx: 617-984-7110
NEPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Comment 58-49)

Amendment: Accept Comment 58-49

☐ Agree

If you agree with this amendment, the result will be to revise 4.4.1 to read as follows:

4.4.1 Qualification of Personnel.

4.4.1 All persons who transfer, transport, or perform other work activities with liquid petroleum gas that fall within the scope of this standard, shall receive training that includes the following components:

1. Scope and time frame of the training, consistent with the nature of the trainee's job;
2. Recognition of the safety and health hazards of work with liquefied petroleum gases;
3. Safe work practices applicable to the employee's job;
4. Emergency response actions;
5. Supervised on-the-job training; and,

☐ Do Not Agree*

If you do not agree with this amendment, the recommendation is to return to previous edition text, and the proposed new text is not added. The existing text reads as follows:

4.4.1 Qualification of Personnel.

Persons who transfer liquid LP-Gas who are employed to transport LP-Gas, or whose primary duties fall within the scope of this code shall be trained in proper handling procedures. Refresher training shall be provided at least every 3 years. The training shall be documented.

☐ Abstain*

*Please give reasons for voting “Do Not Agree” or “Abstain”:

Dropping the refresher training and documentation requirement would be an unacceptable step backwards as far as safety is concerned.

Please return as soon as possible, but no later than Tuesday, June 30, 2010 to:

Jeanne Morean
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
Fax: 617-984-7710

Signature: [Signature]

Name: Please Print: John King

Date: 7/1/2010

June 2010
NFPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Comment 58-49)

Amendment: Accept Comment 58-49

☐ Agree

If you agree with this amendment, the result will be to revise 4.4.1 to read as follows:
4.4* Qualification of Personnel.
4.4.1 All persons who transfer, transport, or perform other work activities with liquid petroleum gas that fall within the scope of this standard, shall receive training that includes the following components:
(1) Scope and time frame of the training, consistent with the nature of the trainee's job;
(2) Recognition of the safety and health hazards of work with liquefied petroleum gas;
(3) Safe work practices applicable to the employees' jobs;
(4) Emergency response actions;
(5) Supervised on-the-job training and,
(6) Testing and performance evaluation.

☒ Do Not Agree*

If you do not agree with this amendment, the recommendation is to return to previous edition text, and the proposed new text is not added. The existing text reads as follows:
4.4* Qualification of Personnel.
Persons who transfer liquid L.P-Gas, who are employed to transport L.P-Gas, or whose primary duties fall within the scope of this code shall be trained in proper handling procedures. Refresher training shall be provided at least every 3 years. The training shall be documented.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":

THE PRESENT TEXT IS PROPER. THE INTERPRETATION OF THE PROPOSED LANGUAGE IS IMPOSSIBLE TO COMPLY WITH. THE NEW PROPOSAL ADDS PERSONS NOT EMPLOYED IN THE INDUSTRY. AN ADDED SECTION TO 4.4 CAN COVER SOME OF THE

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: [Bill Mahre]

Date: [06-30-2010]

June 2010
NFPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Comment 58-49)

Amendment: Accept Comment 58-49

☐ Agree

If you agree with this amendment, the result will be to revise 4.4.1 to read as follows:
4.4* Qualification of Personnel.
4.4.1 All persons who transfer, transport, or perform other work activities with liquid petroleum gas that fall within the scope of this standard, shall receive training that includes the following components:
(1) Scope and time frame of the training, consistent with the nature of the trainee's jobs;
(2) Recognition of the safety and health hazards of work with liquefied petroleum gas;
(3) Safe work practices applicable to the employees' jobs;
(4) Emergency response actions;
(5) Supervised on-the-job training; and,
(6) Testing and performance evaluation.

☐ Do Not Agree*

If you do not agree with this amendment, the recommendation is to return to previous edition text, and the proposed new text is not added. The existing text reads as follows:
4.4* Qualification of Personnel.
Persons who transfer liquid LP-Gas, who are employed to transport LP-Gas, or whose primary duties fall within the scope of this code shall be trained in proper handling procedures. Refresher training shall be provided at least every 3 years. The training shall be documented.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":

The present language is better coverage.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]
Name - Please Print: [Name]
Date: [Date]

June 2010
NFPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Comment 58-49)

Amendment: Accept Comment 58-49

☐ Agree
If you agree with this amendment, the result will be to revise 4.4.1 to read as follows:
4.4* Qualification of Personnel.
4.4.1 All persons who transfer, transport, or perform other work activities with liquid petroleum gas that fall within the scope of this standard, shall receive training that includes the following components:
(1) Scope and time frame of the training, consistent with the nature of the trainee’s job;
(2) Recognition of the safety and health hazards of work with liquefied petroleum gas;
(3) Safe work practices applicable to the employees’ jobs;
(4) Emergency response actions;
(5) Supervised on-the-job training; and,
(6) Testing and performance evaluation.

☒ Do Not Agree*
If you do not agree with this amendment, the recommendation is to return to previous edition text, and the proposed new text is not added. The existing text reads as follows:
4.4* Qualification of Personnel.
Persons who transfer liquid LP-Gas, who are employed to transport LP-Gas, or whose primary duties fall within the scope of this code shall be trained in proper handling procedures. Refresher training shall be provided at least every 3 years. The training shall be documented.

☐ Abstain*

*Please give reasons for voting “Do Not Agree” or “Abstain”:

I believe the additional change is unnecessary.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: [Your Name]

Date: 6-12-10

June 2010
NFPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Comment 58-49)

Amendment: Accept Comment 58-49

☐ Agree

If you agree with this amendment, the result will be to revise 4.4.1 to read as follows:
4.4* Qualification of Personnel.
4.4.1 All persons who transfer, transport, or perform other work activities with liquid petroleum gas that fall within the scope of this standard, shall receive training that includes the following components:
(1) Scope and time frame of the training, consistent with the nature of the trainee’s job;
(2) Recognition of the safety and health hazards of work with liquefied petroleum gas;
(3) Safe work practices applicable to the employees’ jobs;
(4) Emergency response actions;
(5) Supervised on-the-job training; and,
(6) Testing and performance evaluation.

☒ Do Not Agree*

If you do not agree with this amendment, the recommendation is to return to previous edition text, and the proposed new text is not added. The existing text reads as follows:
4.4* Qualification of Personnel.
Persons who transfer liquid LP-Gas, who are employed to transport LP-Gas, or whose primary duties fall within the scope of this code, shall be trained in proper handling procedures. Refresher training shall be provided at least every 3 years. The training shall be documented.

☐ Abstain*

*Please give reasons for voting “Do Not Agree” or “Abstain”:

Training and documentation are more than enough. Adding a subjective “performance evaluation” for all persons that have duties within the scope of NFPA 58 - will open a legal Pandora.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature:  

Name - Please Print:  

Date: 06-16-2010

June 2010
NFPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Comment 58-49)

Amendment: Accept Comment 58-49

☐ Agree
If you agree with this amendment, the result will be to revise 4.4.1 to read as follows:
4.4.* Qualification of Personnel.
4.4.1 All persons who transfer, transport, or perform other work activities with liquid petroleum gas that
fall within the scope of this standard, shall receive training that includes the following components:
(1) Scope and time frame of the training, consistent with the nature of the trainee’s jobs;
(2) Recognition of the safety and health hazards of work with liquefied petroleum gas;
(3) Safe work practices applicable to the employees’ jobs;
(4) Emergency response actions;
(5) Supervised on-the-job training and;
(6) Testing and performance evaluation.

☒ Do Not Agree* If you do not agree with this amendment, the recommendation is to return to previous edition text, and
the proposed new text is not added. The existing text reads as follows:
4.4* Qualification of Personnel.
Persons who transfer liquid LP-Gas, who are employed to transport LP-Gas, or whose primary duties
fall within the scope of this code shall be trained in proper handling procedures. Refresher training shall
be provided at least every 3 years. The training shall be documented.

☐ Abstain*

*Please give reasons for voting “Do Not Agree” or “Abstain”:

The requirement that all persons who “perform other work activities with liquid petroleum
gas” receive training, which includes testing and a performance evaluation is
impractical for workgroups whose primary duties do not fall within the scope of NFPA 58.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature

Name - Please Print: JAMES T. OSTERHAUS

Date: 7-8-10

June 2010
**NFPA 58**  
**TC BALLOT for Liquefied Petroleum Gases**  
**June 2010 ASSOCIATION AMENDMENT**  
*(To Accept Comment 58-49)*

**Amendment:** Accept Comment 58-49

- **Agree**  
  If you agree with this amendment, the result will be to revise 4.4.1 to read as follows:
  4.4.1 Qualification of Personnel.
  (1) All persons who transfer, transport, or perform other work activities with liquid petroleum gas that fall within the scope of this standard, shall receive training that includes the following components:
  (a) Scope and time frame of the training, consistent with the nature of the trainee’s job;
  (b) Recognition of the safety and health hazards of work with liquefied petroleum gas;
  (c) Safe work practices applicable to the employees’ jobs;
  (d) Emergency response actions;
  (e) Supervised on-the-job training; and,
  (f) Testing and performance evaluation.

- **Do Not Agree**  
  If you do not agree with this amendment, the recommendation is to return to previous edition text, and the proposed new text is not added. The existing text reads as follows:
  4.4.1 Qualification of Personnel.
  Persons who transfer liquid LP-Gas, who are employed to transport LP-Gas, or whose primary duties fall within the scope of this code shall be trained in proper handling procedures. Refresher training shall be provided at least every 3 years. The training shall be documented.

- **Abstain**

*Please give reasons for voting “Do Not Agree” or “Abstain”:

[space for notes]

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau  
National Fire Protection Association  
1 Batterymarch Park  
Quincy, MA 02169  
FAX: 617-984-7110

Signature: [signature]

Name - Please Print: [name]

Date: 23/06/2010

June 2010
Very truly yours,

Theodore C. Lemoff
Staff Liaison
NFPA
☎ 617 984-7434
☎ 617 984-7110
✉ le Moff@nfpa.org

Consumer fireworks injure thousands of people each year. View NFPA’s new video PSA highlighting the dangers of consumer fireworks. www.nfpa.org/fireworks
You can easily share the information on this page with others by selecting “email page” on the left side of the screen.

From: philribbs@aol.com [mailto:philribbs@aol.com]
Sent: Thursday, July 08, 2010 5:09 PM
To: Frank.J.Mortimer@emcins.com; Lemoff, Ted
Cc: richard.fredenburg@ncagr.gov; se.coates@sbcglobal.net; james.osternhaus@rrc.state.tx.us; chiefinspector@pg.nv.gov; bwiecicki@npga.org; richard.gilbert@rrc.state.tx.us; gerrymisel@georgiagas.com; sammieter@yahoo.com; dstainbr@regoprodu cts.com; belfe.jim@epa.gov; paul.bogan@sea-3.com; vbogosian@nationalboard.org; ronald.r.czischke@us.ul.com; stgentry@worthingtonindustries.com; rahoffmann@hoffmann-feige.com; stanley.kastanas@dot.gov; harold.l.philipppl@exxonmobil.com;
tmsinc1981@verizon.net; stannardandcompany@verizon.net; fvolgust376@aol.com; pandwvr@tampabay.rr.com; WYOUNG26216@msn.com; snecl@sprynet.com; david.burnell@puc.nh.gov; afossa@mdj.com.br; Cegarza@garob.com; billmahre@aol.com; gkenn.mahnken@fmglobal.com; lesliewoodward@buffalo.fairviewfittings.com; donb@enmat.co.uk; bfi@chart er.net; alex.dimopoulos@exxonmobil.com; rfreeman@free mngas.com; weshayes@polkfi.com; skhazra@aegisindia.com; hess.george@epa.gov; roger.maxon@berm zomatic.com; hari.ramanathan@lapmort.org; carlion.revere@reveregas.com; sdruffcorn@standby.com; mrupp@suburbanpropane.com; s.younis@comcast.net; Robert.A.Zeman@us.ul.com; gerencia@saena.com.co; chinibaro,m@do l.gov; kenlun@netvigator.com; dswitzer@cpsc.gov; hamilton.bill@dol.gov
Subject: Re: NFPA 58 TC

Ted

I too am confused therefore I am changing my vote from affirmative to Negative.
Reason: Additional verbiage is not necessary.

Phillip Ribbs
Moreau-Correia, Jeanne

From: Dave Stainbrook [dstainbr@regoproducts.com]
Sent: Friday, July 09, 2010 7:57 AM
To: Moreau-Correia, Jeanne
Subject: 58-49 Ballot

I am changing my vote to negative, although the refresher training and documentation concerns initially raised have been resolved, I find some of the proposed requirements such as "testing and performance evaluation" to be vague. What is a passing score? 50% 10%? The current code language covers the training requirements and is quite specific about who is required to be trained.

---

David Stainbrook
VP Engineering & Technical Services
Engineered Controls/RegO Products
100 RegO Drive Elon NC 27244
336-446-7272
James H. Stannard, Jr.

June 28, 2010

Votes and Comments on

Association Amendments 58-30, 49, and 154

On Amendment 58-30, I vote negatively

COMMENT: This amendment is totally unnecessary and adds nothing to the usefulness of NFPA 58. Even a casual reading of the document makes it clear that the code covers both the liquid and gaseous states of LPG. Anyone attempting to utilize the code that does not comprehend the present language and intent of the code with respect to its applicability to both the gaseous and liquid phases is certainly not qualified to either use or interpret the code.

On Amendment 58-49, I vote negative

COMMENT: This amendment would not add any additional useful requirements to the training of personnel involved in the handling of LPG. On the contrary, it will add unnecessary burdens to the documentation of training that is presently required by NFPA 58. Those additional burdens will be an invitation to maintain less than forthright training records, particularly in the case of the smaller marketers. In addition, the proposed language does away with the presently required re-training.

On Amendment 58-154, I vote negatively.

COMMENT: I find the proposed amendment does not enhance safety, but on the contrary may actually reduce safety.

James H. Stannard, Jr.
NFPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Comment 58-49)

Amendment: Accept Comment 58-49

[ ] Agree
If you agree with this amendment, the result will be to revise 4.4.1 to read as follows:
4.4.1 Qualification of Personnel.
4.4.1 All persons who transfer, transport, or perform other work activities with liquid petroleum gas that fall within the scope of this standard, shall receive training that includes the following components:
(1) Scope and time frame of the training, consistent with the nature of the trainee’s jobs;
(2) Recognition of the safety and health hazards of work with liquefied petroleum gas;
(3) Safe work practices applicable to the employees’ jobs;
(4) Emergency response actions;
(5) Supervised on-the-job training; and,
(6) Testing and performance evaluation.

[ ] Do Not Agree
If you do not agree with this amendment, the recommendation is to return to previous edition text, and the proposed new text is not added. The existing text reads as follows:
4.4.1 Qualification of Personnel.
Persons who transfer liquid LP-Gas, who are employed to transport LP-Gas, or whose primary duties fall within the scope of this code shall be trained in proper handling procedures. Refresher training shall be provided at least every 3 years. The training shall be documented.

[ ] Abstain

*Please give reasons for voting “Do Not Agree” or “Abstain”:
(1) I am unclear as to what #1 requires.
(2) The new text will omit the important requirement for refresher training every 3 years.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: ___________________________
Name - Please Print: Bruce Swiericki
Date: 6/16/10

June 2010
NFPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Comment 58-49)

Amendment: Accept Comment 58-49

☐ Agree

If you agree with this amendment, the result will be to revise 4.4.1 to read as follows:
4.4.1 Qualification of Personnel.

☐ Do Not Agree

If you do not agree with this amendment, the recommendation is to return to previous edition text, and
the proposed new text is not added. The existing text reads as follows:
4.4.1 Qualification of Personnel

☐ Abstain

* Please give reasons for voting “Do Not Agree” or “Abstain”

Workers who have only incidental contact with a propane cylinder
would normally undergo training with this comment. If the primary duties fall within this scope, they are are well
able to perform other work activities.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

[Signature]

Name: Please Print  Leslie Woodward
Date: July 8, 2010

June 2010
From: pandwrr@tampabay.rr.com  
Sent: Thursday, July 08, 2010 5:25 PM  
To: Moreau-Correia, Jeanne; Frank J. Mortimer  
Subject: NFPA 58-49 Vote change

I would like to change my vote to the negative on 58-49.  
Reason: "Additional verbiage is not necessary."

Thomas Wilson  
City of Winter Park, Fl
Moreau-Correia, Jeanne

From: William Young Home [wyoung26216@msn.com]
Sent: Tuesday, July 13, 2010 11:57 PM
To: Moreau-Correia, Jeanne
Subject: FW: Bill Young Vote Change

Follow Up Flag: Follow up
Flag Status: Flagged

This is the note I sent to Ted on July 8, 2010. It was not shown in your tally.

Bill Young

From: wyoung26216@msn.com
To: tlemoff@nfpa.org
Subject: RE: Bill Young Vote Change
Date: Thu, 8 Jul 2010 22:11:01 -0400

Ted:

Regarding 58-49, I would like to change my vote to negative. The reason is that the existing Committee text is clearer, and the training is well covered. The term "Performance Evaluation" with no guidance or bench marks is too subjective. Is retaining 50% of the training acceptable? Should it be 70%? Is a score of less than 95% unacceptable? The reader has no idea of what this means.

Best regards,

Bill Young

From: tlemoff@nfpa.org
To: wyoung26216@msn.com
Date: Thu, 8 Jul 2010 22:06:45 -0400
Subject: RE: Bill Young Vote Change

Bill,

Sorry for the confusion. The ballot on 58-49 has been extended until tomorrow. If you wish to vote negatively, please so state, with your reason.

Thanks,

Ted

Very truly yours,

Theodore C. Lemoff
Staff Liaison
NFPA
☎ 617 984-7434
✆ 617 984-7110
NFPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Comment 58-49)

Amendment: Accept Comment 58-49

Agree

If you agree with this amendment, the result will be to revise 4.4.1 to read as follows:
4.4* Qualification of Personnel.
4.4.1 All persons who transfer, transport, or perform other work activities with liquid petroleum gas that fall within the scope of this standard, shall receive training that includes the following components:
(1) Scope and time frame of the training, consistent with the nature of the trainee's jobs;
(2) Recognition of the safety and health hazards of work with liquefied petroleum gas;
(3) Safe work practices applicable to the employees' jobs;
(4) Emergency response actions;
(5) Supervised on-the-job training; and,
(6) Testing and performance evaluation.

Do Not Agree*

If you do not agree with this amendment, the recommendation is to return to previous edition text, and the proposed new text is not added. The existing text reads as follows:
4.4* Qualification of Personnel.
Persons who transfer liquid LP-Gas, who are employed to transport LP-Gas, or whose primary duties fall within the scope of this code shall be trained in proper handling procedures. Refresher training shall be provided at least every 3 years. The training shall be documented.

Abstain*

*Please give reasons for voting “Do Not Agree” or “Abstain”:

I hereby change my previous vote (do not agree) which was cast due to a misunderstanding of what floor action was during the annual meeting.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Morneau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: PHANI RAJ

Date: 7/8/2010

June 2010
COMMENT 58-49 (A2010) Accept Comment

58-49 Log #131 Final Action: Reject

Comment on Proposal No: 58-46
Recommendation: Add text to read as follows:

All persons who transfer, transport, or perform other work activities with liquid petroleum gas that fall within the scope of this standard, shall receive training that includes the following components:
- Scope and time frame of the training, consistent with the nature of the trainee’s jobs;
- Recognition of the safety and health hazards of work with liquefied petroleum gas;
- Safe work practices applicable to the employees’ jobs;
- Emergency response actions;
- Supervised on-the-job training; and,
- Testing and performance evaluation.

Substantiation: Training requirements are necessary in the body of the standard so that they are enforceable. The suggested requirement language reflects a commonly accepted framework for performance-based training programs (Sec 29 CFR 1910.119).

Committee Meeting Action: Reject
Committee Statement: The committee affirms its action in the ROP. Training and documentation of training are required by NFPA 58, and most current programs include testing and certification.

Number Eligible to Vote: 26
Ballot Results: Affirmative: 23 Negative: 2
Ballot Not Returned: 1 Garza-Obregon, C.

Explanation of Negative:
BELKE, J.: The mere documentation of attendance at training does not insure that the important points of the training have been committed to memory or that the attendee understands how to apply what he/she has heard. The committee statement says that “most current programs include testing and certification.” If so, then this should be a reason to include such a requirement in this code, as it is the generally accepted practice in the industry.

KASTANAS, S.: Agree and support Mr. Belke’s comment to include testing and/or some type of training evaluation documentation as part of the training requirement.

Committee Meeting Action: Accept in Principle
Recommendation: Add a new A.4.4 to read:

A.4.4 Examples of training programs are:
1. The Certified Employee Training Program developed by the PERC, www.propanecouncil.org
2. Programs developed by propane companies.
3. Programs developed by government entities.

The term refresher indicates that the periodic training could be less intensive than the original training, whose primary purpose is to reinforce initial training rather than repeat it.

Committee Statement: Annex A text is added to provide examples of the types of training that can be used to meet the requirements of Section 4.4

Number Eligible to Vote: 29
Ballot Results: Affirmative: 26 Negative: 1
Ballot Not Returned: 2 Bogosian, Jr., V., Sutton, M.

Explanation of Negative:
PHILLIPPI, H.: Do not feel this adds value because the phrase “immediate cause of the explosion was a dangerous release” does not go to the root cause of the release which was a failed valve which goes unmentioned/analyzed as a cause.

Comment on Affirmative:
BELKE, J.: The committee action does not sufficiently incorporate the CSB proposal. Adding text to annex A is okay, but by itself will not improve training in the industry or prevent accidents like the Ghent, WV explosion. A specific code requirement is called for.

CZISCHKE, R.: In addition to the new annex text proposed, it is important that training of personnel include how to respond to emergency situations. The following is proposed to be added to 4.4

4.4 Qualification of Personnel. Persons who transfer liquid LP-Gas, who are employed to transport LP-Gas, or whose primary duties fall within the scope of this code shall be trained in proper handling procedures, and how to respond to emergency situations. Refresher training shall be provided at least every 3 years. The training shall be documented.

MCTIER, S.: In the next to last line change “whose” to “where” to avoid the use in this case of the pronoun “whose.”

Submitter: John S. Bresland, U.S. Chemical Safety and Hazard Investigation Board
Recommendation: Revise text to read as follows:

In Liquefied Petroleum Gas Code (NFPA 58), revise the “Qualifications for Personnel” section (4.4), to specify training requirements (including supervised on-the-job training), attaining curricula, competencies, and testing through written examination and performance evaluation, or reference a nationally recognized curriculum for these requirements.

Substantiation: The U.S. Chemical Safety and Hazard Investigation Board (CSB) conducted an investigation of the propane explosion that occurred at the Little General Store in Ghent, West Virginia on January 30, 2007. The CSB published a report on the findings of the investigation, ‘Little General Store - Propane Explosion’ on September 25, 2008. Within the report is a recommendation to the National Fire Protection Association (NFPA). The report can be found at the CSB website (www.csb.gov).

The investigation concluded that the immediate cause of the explosion was a dangerous release of propane that leaked into the store and ignited during a propane transfer from an existing tank to a newly installed replacement tank. A junior propane service technician was preparing to transfer the propane, unsupervised, when he fully removed a plug from a malfunctioned liquid withdrawal valve, releasing propane uncontrollably in the store through overhanging attic vents located above the tank. The release contained for 25 minutes as emergency responders and a senior propane service technician arrived. Soon after, the propane ignited and leveled the store. Two propane service technicians and two emergency responders were killed. Four store employees inside the building as well as two other emergency responders outside the store were injured, some severely.

The investigation revealed that the junior technician’s training was inadequate for performing the task of transferring liquid propane from tank to tank while unsupervised. Further investigation exposed the absence of effective training guidance for propane technicians in both regulatory and voluntary standards. Specifically, NFPA 58, Liquefied Petroleum Gas Code, recommends training for propane industry employees who transport and transfer liquefied petroleum gas and refresher training, but does not clarify what should constitute the initial training. Guidance that provides explicitly training requirements with a curriculum and a testing component would facilitate an enforceable training standard to assist states that have adopted or will adopt NFPA 58.

Committee Meeting Action: Accept in Principle
Recommendation:

Add the following text to 4.4:

A.4.4 Examples of training programs are:
1. The Certified Employee Training Program developed by the PERC, www.propanecouncil.org
2. Programs developed by propane companies.
3. Programs developed by government entities.

The term refresher indicates that the periodic training could be less intensive than the original training, whose primary purpose is to reinforce initial training rather than repeat it.

Committee Statement: Annex A text is added to provide examples of the types of training that can be used to meet the requirements of Section 4.4

Number Eligible to Vote: 29
Ballot Results: Affirmative: 26 Negative: 1
Ballot Not Returned: 2 Bogosian, Jr., V., Sutton, M.

Explanation of Negative:
PHILLIPPI, H.: Do not feel this adds value because the phrase “immediate cause of the explosion was a dangerous release” does not go to the root cause of the release which was a failed valve which goes unmentioned/analyzed as a cause.

Comment on Affirmative:
BELKE, J.: The committee action does not sufficiently incorporate the CSB proposal. Adding text to annex A is okay, but by itself will not improve training in the industry or prevent accidents like the Ghent, WV explosion. A specific code requirement is called for.

CZISCHKE, R.: In addition to the new annex text proposed, it is important that training of personnel include how to respond to emergency situations. The following is proposed to be added to 4.4

4.4 Qualification of Personnel. Persons who transfer liquid LP-Gas, who are employed to transport LP-Gas, or whose primary duties fall within the scope of this code shall be trained in proper handling procedures, and how to respond to emergency situations. Refresher training shall be provided at least every 3 years. The training shall be documented.

MCTIER, S.: In the next to last line change “whose” to “where” to avoid the use in this case of the pronoun “whose.”
CSB Appeal for Amendment 58-49

To the NFPA Standards Council:

The U.S. Chemical Safety and Hazard Investigation Board (CSB) investigated a deadly propane explosion that occurred at a convenience store in Ghent, West Virginia on January 30, 2007. The explosion killed two firefighters and two propane technicians. Five people, including two other emergency personnel, were severely injured.

The CSB conducted a thorough inquiry into all aspects of this tragedy and found that an uncontrollable release of propane occurred when an inexperienced propane technician was preparing for a tank-to-tank liquid transfer. A 500-gallon propane tank was installed directly against the store’s exterior wall. The technician removed a plug from the tank’s liquid withdrawal line causing a propane release that lasted over 28 minutes. There was no evacuation. The propane eventually reached an ignition source and exploded, destroying the store and causing the fatalities and injuries.

Tank-to-tank transfers are among the most dangerous tasks a propane technician can undertake. It is a task only to be performed by the most experienced technicians; not one for a technician on the job for only six weeks.

The CSB investigation team examined NFPA 58 to determine the training requirements for propane technicians. The team found that NFPA 58 does require training but does not define the training, the curriculum, or the knowledge that a propane technician must possess. The code states that those transferring liquid LPG “shall be trained in proper handling procedures…” However, Section 2.2.2.3 of the Manual of Style for NFPA Technical Committee Documents – 2004 states that terms contained in Table 2.2.2.3 (including “proper”) shall be reviewed in context, and if the resulting requirement is unenforceable or vague, they shall not be used within the body of codes or standards. The team found that the use of “proper” in NFPA 58 was vague, unenforceable, and inconsistent with the Manual of Style requirement for clear and precise requirements. Therefore, on September 25, 2008, the CSB presidentially-appointed board made a formal recommendation to the NFPA 58 committee on to improve the propane technician training language:

Recommendation no. 2007-04-I-WV-R5

In the Liquefied Petroleum Gas Code (NFPA 58) "Qualifications for Personnel" section, specify training requirements (including supervised on-the-job training), training curricula, competencies, and testing through written examination and performance evaluation, or reference a nationally recognized curriculum for these requirements.

In response to the recommendation during the proposal phase, the committee decided to place reference material in the annex for section 4.4 “Qualification of Personnel”. While this is a good addition, the annex material is not required or enforceable. Another proposal to add an emergency response component to that section was accepted by the committee but CSB staff still felt that this component alone was not equivalent to
comprehensive training. The CSB Board Members intended to add enforceable training requirements in the code such as:

- a training timeframe
- hazard recognition
- supervised on-the-job training
- safe work practices
- emergency actions
- testing and performance evaluation

These requirements would clarify in NFPA 58 what constitutes “proper handling procedures” users, installers, regulators, and authorities having jurisdiction would no longer be forced to interpret the definition of “proper.” The CSB recommendation seeks only clearer definition of what the code already requires; it does not entail additional or more burdensome training requirements.

Propane is used in millions of applications across the country. The CSB found that an incident involving propane that requires the assistance of a fire department occurs nearly once a day in the US. It is highly energetic – potentially explosive -- and therefore and must be handled by trained technicians with the greatest of care. The widespread use of propane and the frequency of propane incidents demands that technicians receive comprehensive training.
MR. WANKO: Good morning. Jeff Wanko representing the United States Chemical Safety Board. And I'm making a **motion to accept Comment 58-49**.

MR. JARD: Okay. The motion on the floor is to accept Comment 58-49. Is there a second? There is a second. Please proceed.

MR. WANKO: Thank you. Good morning. In January 2007 deadly propane explosions occurred in a convenient store in West Virginia. The explosion killed two firefighters and two propane technicians. Five people, including two other emergency personnel, were severely injured. This horrible tragedy should not have happened.

I led the United States Chemical Safety Board's investigation. Our team conducted a thorough inquiry to all aspects of this tragedy. We determined that an uncontrollable release of propane occurred when an inexperienced propane technician was preparing for a tank-to-tank liquid transfer.

A 500-gallon propane tank was installed directly against the store's exterior wall. The technician removed the plug from the tank's liquid withdrawal line, causing a propane release that
lasted over 28 minutes. There was no evacuation.

The propane eventually reached an ignition source and exploded, completely destroying the store and causing fatalities and injuries.

Tank-to-tank propane transfers are among the most dangerous tasks a propane technician can undertake. It is a task only to be performed by the most experienced technicians, not one for a technician on the job for only six weeks.

Propane is used in millions of applications across the United States, in homes, farms, and workplaces. Our research has shown that an incident involving propane requiring the assistance of the fire department occurs nearly once a day in the United States.

Among many other aspects of our investigation, my team examined NFPA 58 to determine the training requirements for propane technicians. We found that NFPA 58 does require training but does not define the training, the curriculum, or the knowledge that a propane technician must possess.

The Code states that those transferring propane only, quote, shall be trained in proper handling techniques.

The CSB's presidentially appointed board
made a formal recommendation to the NFPA 58 Committee on September 5th, 2008, to approve the propane technician training violation because the use of the word "proper" is vague, unenforceable, and inconsistent with the NFPA's own manual of style for clear and precise requirements.

In response to our recommendation during the proposal phase, the Committee decided to place reference material in the annex. While this is a good addition, the annex material is not required nor enforceable. The CSB intended to add an enforceable training code, such as a training time frame, supervised on-the-job training, safe work practices, hazard recognition, emergency actions, and a means by which to judge the trainee's knowledge.

The Board believes the NFPA Committee should incorporate these modern training elements into the Code. The CSB recommendation seeks only clear definition of what the Code already requires. It does not entail additional or more burdensome training requirements.

Following the NFPA Report on Proposals, the CSB submitted comments to the NFPA Committee to clarify our recommendation. Our comments reflect the principles of chemical process safety found in OSHA's
Regulations and EPA's Risk Management Program.

We were disappointed, however, when we learned the Committee rejected all but one of our comments. The Committee added an emergency response component to the training requirements, but this element alone is not equivalent to comprehensive training in the view of the CSB. We believe that if this language is not changed, we are bound to experience a repeat of this same type of incident.

In the Fuels Relief Act of 1999, Congress intended that NFPA 58 act as a safety regulation for the propane industry. Only by improving the training language can the Code achieve this goal. The widespread use of propane and the frequency of propane emergencies demands that technicians receive comprehensive training.

The CSB firmly believes this change in NFPA 58 is necessary to save lives of propane technicians, firefighters, and the public by reducing the number of propane emergencies that involve inexperienced propane technicians.

I am here representing the Chemical Safety Board today to urge the NFPA to adopt our recommendation and pass this motion. Thank you.
1. Offer the Committee's position?

   MR. MORTIMER: Yes, please. There were several changes made to Section 4.4 by the Committee. Some of these were made with an eye towards the Chemical Safety Board and their requests and also the additions that Jeff mentioned that were placed in the appendix as well.

   While Jeff mentions the recommendation comes from a terrible event in North Carolina where there was much life lost, the current requirements that training be done were ignored. And that is probably more likely the result of the lack of using the current Code than it is of needing additional code.

   The Technical Committee reviewed, revised, and deliberated at great length the changes that were recommended by the Chemical Safety Board. The Technical Committee has concerns that applying such a broad brush in this requirement for all persons in the industry would be unworkable.

   While it might be good to apply some of such testing to persons that spend a majority of their working day delivering and servicing propane, to ask the recreational vehicle park owners, the convenient store owners, and others that have a cylinder fill or cylinder cage to apply the same stringent requirement
to the revolving door of employees that they have to train and work with in their businesses, the Technical Committee did not include much of what the U.S. Chemical Safety Board had, but rather placed it in the annex where it could be used as reference material for the industry.

MR. JARD: Thank you, Mr. Mortimer. With that, we'll open up debate on this motion. Remember to please provide your name, affiliation, and whether you're for or against the motion. Microphone

MR. FREDENBURG: Richard Fredenburg, North Carolina Department of Agriculture and Consumer Services, Standards Division. I'm speaking against the motion.

I do want to correct something Mr. Mortimer just said, that the accident was in North Carolina. It was actually in West Virginia.

The issue of training has been brought up many times in the Committee. I'm also a Committee member. And with the definition that's there, a number of states have taken it upon themselves to create their own required training programs. And the language in the Code allows that. Others have somewhat defaulted to some of the industry standards,
such as the certified employee training program.

And I'm afraid that if the language that is being proposed goes into effect, that some of those existing states that have already developed their own programs will have to seriously modify them. And it will take some of the independence of the states rights away to design a program that fits their needs.

MR. JARD: Is there any further discussion from the floor? Mr. Mortimer, do you have any final comment?

MR. MORTIMER: No, I'd say --

MR. JARD: Oh, I'm sorry, Mr. Gomez. Mike 5. I didn't see you. I apologize.

THE WITNESS: Jeff Wanko, United States Chemical Safety Board, again speaking for the motion.

If I may correct something Mr. Mortimer said. The root cause in this accident, one of many root causes, was certainly the training that this junior technician was given. He was in a training program. He was slated for a spot in the next round of CTEP that his employer was going to hold.

However, he was advanced in his on-the-job training to a point where he could perform this tank-to-tank liquid transfer, which he was
inexperienced for. And he was unable to act when an
emergency occurred. And that's what this case was
about. It was about the actions taken during the
emergency. There were a lot of other factors that
led to this. Certainly if you read our report or
watch our video on this incident, there were a lot of
causes, but certainly his inexperience was an
important factor. Training was not ignored in this
case.

I would like to read a letter from Sterling
Lewis, West Virginia State Fire Marshall, if I may,
to the Honorable John Breslin, Chairman of the U.S.
Chemical Safety Board.

"Dear Chairman Breslin:

"The West Virginia Office of the State Fire
Marshall supports the efforts of the U.S. Chemical
Safety and Hazard Investigation Board to add modern
performance-based language to the training
requirements of NFPA 58.

"The Office of the State Fire Marshall
responded to the tragic explosion and fire at the
Little General Store in West Virginia and along with
the CSB determined that the incident was entirely
preventable.

"As a long-standing member of the fire
service, I found that propane emergencies happen too
frequently. My staff and the staff of all municipal
fire departments across the United States often
depend upon the expertise of propane technicians to
advise responders on the proper course of action
during these events.

"Only by adding specific and enforceable
language to the training requirements of NFPA 58 can
we be assured that these incidents do not result in
tragic outcomes in the future.

"Please consider the CSB's motion for the
addition to the proposed language. Thank you.

"Sterling Lewis, Jr., Virginia State Fire
Marshall."

Again, our motion here is not to add an
additional requirement or to detract from what states
have done. We understand all states have adopted
NFPA 58 in one fashion or another.

Our goal here is to add modern training
language that can be found in the PSM, the RMP, under
OSHA and NFPA, respectively, and to give those
employers out there, those propane marketers,
guidance on what a good training program, a
comprehensive training program, constitutes.

Simply by leaving the existing language in
NFPA 58, proper handling techniques gives the propane marketers no guidance. Our language adds to that, gives them guidance, does not detract from what the states have done, and will improve safety across the nation. Thank you.

Mr. Jard: Microphone 6.

Mr. Fredenburg: Again, Richard Fredenburg, North Carolina Department of Agriculture and Consumer Services, Standards Division. Speaking as an enforcement official --

Mr. Jard: For or against?

Mr. Fredenburg: I'm sorry, against the motion. Speaking as an enforcement official, we find that in the incident that's being discussed, the fault was with the person who had been trained because he knew that the junior person had not received full training. But contrary to his training, he left to go to another site to do another job. And when he came back, he violated some more of the training.

So even though his training was completed, was documented, he didn't follow it. So it's more an issue of following the training than getting the training. And this is what we found in several incidences in my state too.
MR. JARD: Mr. Mortimer?

MR. MORTIMER: Tank-to-tank transfer by petroleum companies is not done often and never should be left to an individual that has been with a company a short time and has received as of yet no training to actually perform that task.

The issue here is not so much the change that is being requested by the Chemical Safety Board but that the current training requirements weren't being followed. And if those individuals had been trained and done their job correctly, we wouldn't be talking about this incident at all.

Let's get back to the section that Jeff is asking for the change on. There were several requests for change on this section. The Technical Committee did include much of what those changes requested asked for. We have passed on to you our best at being able to present the changes to the "qualified person" definition that we have.

MR. JARD: Thank you. With that, we'll move to a vote on the motion. And, restated, that motion is to accept Comment 58-49.

All in favor of the motion, please raise your hand. All opposed please raise your hand. I can't tell. We're going to go to a standing vote.
It was kind of a little too spread out to tell.

All those in favor of the motion, please stand. You may be seated. All those opposed to the motion, please stand. Thank you. You may be seated.

The vote was 66 for and 35 against. The motion carries.

Okay. Motion 58-6, the next on our docket on NFPA 58, appeared on our agenda. However, the authorized maker of the motion has notified NFPA that they no longer wish to present this motion.

Therefore, in accordance with NFPA rules, Convention Rules 2.6, the motion may not be considered by the assembly and is removed from the agenda. We will now move on to the next motion, that motion being Motion 58-7. Microphone Number 3.

MR. FREDENBURG: Richard Fredenburg, North Carolina Department of Agriculture and Consumer Services, Standards Division. I move that proposal 58-154 be accepted. However, I wish to make a slight modification to it during the discussion.

MR. JARD: But before I rule on whether or not we're going to entertain that modified motion, can you please explain how you want to modify your motion?

MR. FREDENBURG: We would not include the
July 16, 2010  
Ms. Linda Fuller  
National Fire Protection Association  
One Batterymarch Park  
Quincy, MA 02169

Re: Standards Council Appeal on Comment 58-49

Dear Ms. Fuller: I am writing this to you in hopes you can present this to the Standards Council, if I am not able to attend, the August meeting. I understand you need this by the sixteenth of July.

In representing Insurance industry interests, on the NFPA 58, LP Gas Code, TC, I know you will understand, the goal of having a well trained industry working in the LP Gas field is of utmost importance, to all insurers. We work with our LPG policyholders, and other firms using LPG, to be sure they have the tools they need to safely complete the tasks they have in their daily work.

The US Chemical Safety Board has done a good job in submitting a proposal, with the intent of improving the training in the industry. The NFPA 58, LP Gas Code, Technical Committee did their job well in, discussing the proposal, Accepting in Part, and making very good changes to the 4.4 section and the Annex, to try to clarify the changes and requirements to those that use the code. During the Comments processes, several comments were sent in and reviewed by the TC. The TC considered all of the comments and additional work and revision on the 4.4 section and related Annex were processed, by the TC.

In short, the process of building and producing a good workable code, by using the “consensus process”, was applied and the TC did, in my opinion, their job well. Obviously, the exact wording the CSB had submitted underwent some changes during this process. The goal, of the TC, in our discussions, were to include as much as possible in the code and be sure the Annex was clear in what the users of the code should be doing. Again, I believe we did that well.

The wording of the CSB proposal, was not, and currently, is not, something that should be placed into the code as it is. All of which has been dutifully considered by the TC and the public. There are a number of concerns, some of which could open the entire industry to legal ramifications, which I’m sure were not intended by the CSB.

The CSB developed the proposal, from an incident, in which NONE of the current NFPA 58, training requirements, were being followed. I and the TC believe the firm should have complied with the training requirements already in place, in the code. We also feel, in part from the CSB input, we have improved the current requirements, in the process of submitting to you the partial revision of NFPA 58. While I can understand the consensus process can be disappointing to some submitters of proposals, the process does do a good job in not allowing any one entity to dictate what must be placed in the code. This also allows the LP Gas Code, to be widely accepted and adopted in many States, regions and countries.

My request to you as Chair of the NFPA 58, LP Gas Code, is for you to allow the consensus process to be applied as it has. While I would like for all of the hard work done by the Technical Committee in this last revision process to be included in the 2011 edition, I do understand that
since the NITMAN made by CSB, passed on the floor in Las Vegas, and the motion failed to have the needed TC affirmative ballots, the wording in the previous edition, (2008), would normally be what appears in the next edition. While that is less than ideal, it has gone through the consensus process and is much better than including a poorly worded, hugely encompassing proposal with possible legal ramifications for the industry users.

Thank you for your consideration in this matter.

Sincerely,

Frank J. Mortimer  
Chair, NFPA 58, LP Gas Code  
EMC Insurance Companies  
Risk Improvement Field Services Supervisor  
717 Mulberry, Des Moines, IA, 50309

Cc: T. Lemoff
July 12, 2010

Ms. Linda Fuller
National Fire Protection Association
One Batterymarch Park
Quincy, MA 02169

Re: Standards Council Appeal on Comment 58-49

Dear Ms. Fuller:

I am writing to you at the direction of Ted Lemoff so that as a member of the NFPA Technical Committee on Liquefied Petroleum Gases, I can register my feelings with the Standards Council regarding the appeal that has been lodged by the U.S. Chemical Safety Board (USCSB).

As you will recall, the USCSB has appealed the vote of the NFPA Technical Committee regarding NITMAM 58-5, which was accepted by the NFPA membership in Las Vegas this past June. I'm sure the members of the Standards Council will review all the information contained on the ballots that were submitted by technical committee members, but I wanted to summarize my objection to the acceptance of Comment 58-49 because I've continued to learn things even after I submitted my ballot.

The proposal has a subtle wording change that actually has a major impact on the applicability of the training requirements in NFPA 58. The acceptance of Comment 58-49 would result in the striking of part of the language that was accepted in Comment 58-4. I have attempted to show the stricken language, and the entire section as it would read with the acceptance of Comment 58-49, below.

4.4* Qualification of Personnel.

4.4.1 Persons who transfer liquid LP-Gas, who are employed to transfer LP-Gas, or whose primary duties fall within the scope of this code shall be trained in proper handling procedures. All persons who transfer, transport, or perform other work activities with liquid petroleum gas that fall within the scope of this standard, shall receive training that includes the following components:

1. Scope and time frame of the training, consistent with the nature of the trainee’s jobs;
2. Recognition of the safety and health hazards of work with liquefied petroleum gas;
3. Safe work practices applicable to the employees’ jobs;
4. Emergency response actions;
4.4.3 The training shall be documented.

Note that when we lose the language, “...whose primary duties fall within the scope of this code,” we are left with the language, “...or perform other work activities with liquid petroleum gas that fall within the scope of this standard...,” Thus, we are saddled with new language that requires even workers who have the most incidental contact with a propane cylinder to undergo training on what actions to take during an emergency and must be tested and have their performance evaluated!

Those that have been on the Technical Committee long enough may recall the delicate “word-smithing” that was done to arrive at the true intent of the Committee as expressed in the verbiage, “whose primary duties fall within the scope of this code.” In my opinion, we must hold fast to that wording so that it is clearly understood that individuals, such as those working at convenience stores, are not required to undergo training and evaluation for the very minimal tasks that they perform with respect to propane.

Thank you for your consideration.

Sincerely,

Bruce J. Swiecicki

cc: Frank Mortimer, Ted Lemoff, Sam McTier, Gerry Misel, Rob Freeman, Russ Rupp, Carlton Revere
ASSOCIATION AMENDMENT
BALLOT RESULTS

DATE: July 9, 2010

AMENDMENT


Motion: To Accept Comment 58-154

TC FINAL Ballot Results

According to 4.7.1 in the NFPA Regs (RGCP), the final results show this Amendment HAS achieved the necessary \(\frac{2}{3}\) majority vote needed to recommend approval of the Association Action by the Technical Committee.

The number of affirmative votes needed for the report to be published is \(18\).

\[
[28 \text{ (eligible to vote)} - 2 \text{ (not returned)} - 0 \text{ (abstentions)} = 26 \times 0.66 = 17.16]
\]

In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required.

\[
[28 \text{ eligible} \div 2 = 14 + 1 = 15 \text{ (this is the simple majority)}]
\]

28 Eligible to Vote
2 Not Returned (Garza-Obregon, Volgstadt)

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<tr>
<td>19</td>
<td>Agree (McTier w/comment)</td>
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<tr>
<td>7</td>
<td>Do Not Agree (Brunell, Czischke, Kastanas, King, Osterhaus, Raj, Stannard)</td>
</tr>
<tr>
<td>0</td>
<td>Abstain</td>
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Final Action: PASS
NFPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Proposal 58-154)

Amendment: Accept Proposal 58-154, modified during the Tech Session to delete the following sentence: “This requirement shall apply to all new installations and to all existing installations within one year of adoption of this code”

☐ Agree

1. Add 11.4.1.6 as proposed in Proposal 58-154. As this paragraph duplicates new paragraph 11.5.2.2 adopted in Comment 58-135, there will be no change. The paragraph reads:
   Containers for stationary engines shall be installed to meet the separation requirements of Section 6.3, except as modified in Section 11.4.1.7

☐ Do Not Agree*

2. Add a new section 11.15.2.3 (originally 11.14.1.6 in Proposal 58-154) to read:
   “Where containers for stationary engines have a fill valve with an integral manual shutoff valve, the minimum separation distances shall be one-half of the distances specified in Section 6.3.”

☐ Abstain*

*Please give reasons for voting “Do Not Agree” or “Abstain”:

I do not believe this will maintain the current level of safety.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: David Burnell

Date: 6/28/10

June 2010
July 1, 2010

TO:       Jeanne Moreau
Technical Projects Supervisor
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
Ph: 617-984-7586
Fx: 617-984-7110

FROM:    Ronald Czischke

SUBJECT: Circulation of Votes - NFPA 58 Amendment Ballots - Due Wednesday, July 7, 2010

I find the vote on this amendment to be very difficult. I agree with the first paragraph but not the second. Therefore, I am changing my vote from affirmative to negative on Amendment ballot No. 58-154. I agree with the other negative votes that the second part of this amendment, which would allow the separation distances to be reduced to one half if the filler valve incorporates a shutoff valve, does not add to safety. There are other concerns besides filling that need to be considered if the separation distances are to be reduced.

I must point out that this action (accepting the first paragraph but not the second) was the intent of the committee in accepting-in-principle-in-part comment 58-135. I have included comment 58-135 below the wording of the amendment. The committee did not accept the second new paragraph (11.14.1.7) but failed to modify 11.14.1.6 to remove the reference to the new paragraph. But that was clearly the intent of the committee if you read the committee’s statement to Comment 58-135.

I believe the most correct course of action is to modify the new 11.5.2.2 by removing the phrase "except as modified in Section 11.14.1.7." I have shown that in green text on the wording of the amendment.

WORDING ON AMENDMENT BALLOT 58-154

1. Add 11.4.1.6 as proposed in Proposal 58-154. As this paragraph duplicates new paragraph 11.5.2.2 adopted in Comment 58-135, there will be no change. The paragraph reads:
   Containers for stationary engines shall be installed to meet the separation requirements of Section 6.3, except as modified in Section 11.14.1.7

2. Add a new section 11.15.2.3 (originally 11.14.1.6 in Proposal 58-154) to read:
   "Where containers for stationary engines have a fill valve with an integral manual shutoff valve, the minimum separation distances shall be one-half of the distances specified in Section 6.3."

Submitter: Ronald R. Czischke, Underwriters Laboratories Inc

Comment on Proposal No: 58-154

Recommendation: Revise text as follows:

New 11.14.1.6 Containers for stationary engines installed outdoors shall be installed to meet the separation requirements of Section 6.3, except as modified in section 11.14.1.7. This requirement shall apply to all new installations and to all existing installations within one year of adoption of this code.

11.14.1.7 Where containers for stationary engines have a fill valve with an integral manual shutoff valve, the minimum separation distances shall be one half of the distances specified in Section 6.3.

Committee Meeting Action: Accept in Principle in Part

The proposed 11.14.1.7 is not accepted because the committee has determined that the use of a fill valve with an integral shutoff will not impact the separation distances.

Committee Statement: Refer to committee statement on comments 58-131 (Log #CC4) and 58-74 (Log #CC5).
Standards Council Supplemental Agenda
August 3-5, 2010

NFPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Proposal SS-154)

Amendment: Accept Proposal SS-154, modified during the Tech Session to delete the following sentence: "This requirement shall apply to all new installations and to all existing installations within one year of adoption of this code."

☐ Agree

☐ Do Not Agree* If you do not agree with this amendment, the recommendation is to return to previous edition text. Since there was no corresponding previous edition text, the proposed new text to item 2 above is not added.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain".

While I support passive (preferable) and active (demonstrated and periodically tested) mitigating measures to achieve safety, how can an integral shutoff valve be acceptable as a trade-off for reducing separation distance when the committee expertise indicated in 58-13.5 Log. #64 as "not impacting separation distance?" If this is a misread of what the committee meant, then I will reconsider my vote.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02179
FAX: 617-254-7710

Signature: [Signature]

Name - Please Print: Stanley K. James

Date: 6/28/2010

June 2010
Standards Council Supplemental Agenda

NFPA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Proposal 58-154)

Amendment: Accept Proposal 58-154, modified during the Tech Session to delete the following sentence: "The requirement shall apply to all new installations and to all existing installations within one year of adoption of this code."

☐ Agree

1. Add 11.4.1.6 as proposed in Proposal 58-154. As this paragraph duplicates new paragraph 11.5.2.2 adopted in Comment 58-133, there will be no change. The paragraph reads:
   Containers for stationary engines shall be installed to meet the separation requirements of Section 6.5, except as modified in Section 11.14.1.3.

☐ Do Not Agree* If you do not agree with this amendment, the recommendation is to retain the previous edition text. Since there was no corresponding previous edition text, the proposed new text in item 2 above is not added.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain".

Revising the text that makes the requirement apply to both new and existing installations makes this proposal unacceptable. I also question the wisdom of reducing the separation distances.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

James Mooney
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: John Kind

Date: 7/1/2010

June 2010
NFFA 58
TC BALLOT for Liquefied Petroleum Gases
June 2010 ASSOCIATION AMENDMENT
(To Accept Proposal 58-154)

Amendment: Accept Proposal 58-154, modified during the Tech Session to delete the following sentence: “This requirement shall apply to all new installations and to all existing installations within one year of adoption of this code”

☐ Agree

☐ Do Not Agree*

☐ Abstain*

*Please give reasons for voting “Do Not Agree” or “Abstain”:

The requirement to use a filler valve with an integral manual shutoff valve does not reduce the risk of gas discharging from a float liquid level gauge, pressure relief valve, or regulator vent reaching a source of ignition.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: James T. Oetkenhaus

Date: 6-28-10

June 2010
Standards Council Supplemental Agenda  
August 3-5, 2010

**NFPA 58**
**TC BALLOT for Liquefied Petroleum Gases**
**June 2010 ASSOCIATION AMENDMENT**
**To Accept Proposal 58-154**

Amendment: Accept Proposal 58-154, modified during the Tech Session to delete the following sentence: “This requirement shall apply to all new installations and to all existing installations within one year of adoption of this code.”

☐ Agree

1. Add 11.4.1.6 as proposed in Proposal 58-154. As this paragraph duplicates new paragraph 11.5.2.2 adopted in Comment 58-135, there will be no change. The paragraph reads:
   Containers for stationary engines shall be installed to meet the separation requirements of Section 6.3, except as modified in Section 11.14.1.7

☐ Do Not Agree*  

2. Add a new section 11.15.2.3 (originally 11.14.1.6 in Proposal 58-154), to read:
   “Where containers for stationary engines have a fill valve with an integral manual shutoff valve, the minimum separation distances shall be one-half of the distances specified in Section 6.3.”

☐ Abstain*

*Please give reasons for voting “Do Not Agree” or “Abstain”:

I am not convinced that providing an integral manual shut off valve on stationary engine filler valves will improve safety to such an extent that separation distances inside buildings or otherwise can be reduced by a factor of 2 (compared to that required in Table 6.3.1). This provision may actually reduce safety; what if the filler forgets to shut off the valve?

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: Phani Raj

Date: 28 June 2010

June 2010
Moreau-Correia, Jeanne

From: Jim Stannard [stannardandcompany@verizon.net]
Sent: Monday, June 28, 2010 1:51 PM
To: Moreau-Correia, Jeanne
Cc: Walker, Nancy; Moreau-Correia, Jeanne; Lemoff, Ted; david.burnell@puc.nh.gov; afossa@mdj.com.br; Cegerza@garob.com; stgentry@worthingtonindustries.com; rahoffmann@hoffmann-felge.com; stanley.kastanas@dct.gov; jwking@fedins.com; glenn.mahnken@fmglobal.com; james.osterhaus@rc.state.tx.us; tmsinc1961@verizon.net; fvolgst376@aol.com; lesliewoodward@buffalo.fainviewfittings.com; donb@enmat.co.uk; richard.gilbert@rc.state.tx.us; Richard.Gilbert@rc.state.tx.us; roger.maxon@bernzomatic.com; s.younis@comcast.net

Subject: Re: Reminder: NFPA 59 Amendment Ballots - Due Tuesday, June 29, 2010

James H. Stannard, Jr.

June 28, 2010

Votes and Comments on

Association Amendments 58-30, 49, and 154

On Amendment 58-30, I vote negatively

COMMENT: This amendment is totally unnecessary and adds nothing to the usefulness of NFPA 58. Even a casual reading of the document makes it clear that the code covers both the liquid and gaseous states of LPG. Anyone attempting to utilize the code that does not comprehend the present language and intent of the code with respect to its applicability to both the gaseous and liquid phases is certainly not qualified to either use or interpret the code.

On Amendment 58-49, I vote negative.

COMMENT: This amendment would not add any additional useful requirements to the training of personnel involved in the handling of LPG. On the contrary, it will add unnecessary burdens to the documentation of training that is presently required by NFPA 58. Those additional burdens will be an invitation to maintain less than forthright training records, particularly in the case of the smaller marketers. In addition, the proposed language does away with the presently required re-training.

On Amendment 58-154, I vote negatively.

COMMENT: I find the proposed amendment does not enhance safety, but on the contrary may actually reduce safety.

James H. Stannard, Jr.

1
Recommendation: containers installed on cell tower sites. My comment on 58-153. The committee should revisit the subject of propane proposal. However, providing a means of reducing the potential for an stationary engines. Revise to assure this level of compliance.

Substansiation: The needs for providing standby power for remote sites are unique in that often many different users must fit within a small area. Separation requirements for these sites are not clearly defined, as separation requirements for engine fuel systems were not transferred to the Engine Fuel Systems chapter when the chapter was created in the 1992 edition. The new 11.14.1.6 provides clearly defined separation requirements. As these areas are almost always fenced and locked, the public is excluded. The areas are also usually fairly open and well ventilated. Recognizing that it may often be difficult to provide the separation distances that would normally be required, it is reasonable to allow the distances to be reduced if protection is provided to mitigate the consequences of the failure of the back-check devices in the filler valves. Providing a filler valve with an integral manual shutoff valve, such as the Cavagna 66.1261 or 66.1262 or the Rego 7501 or 7502 series, would provide a method to mitigate such a failure. The new 11.14.1.7 would grant some relief in separation requirements for this added level of protection. Application to all sites is important to safety.

Committee Meeting Action: Reject Committee Statement: The proposed text is in conflict with 6.2.2 (4). Number Eligible to Vote: 29 Ballot Results: Affirmative: 23 Negative: 4 Ballot Not Returned: 2 Bogosian, Jr., V., Sutton, M.

Explanation of Negative: CZISCHKE, R.: We believe the committee should reconsider rejection of the subject proposal. We would suggest accept in principle, in part and only accept the new 11.14.1.6 without the new 11.14.1.7 and have the requirement become effective 3 years after the adoption of the code.

Essentially, we have the same rationale as proposal No. 58-153 (Log #66). Please see that statement. It has always been a basic tenet to limit the amount of propane in buildings. This proposal would keep the containers outside where they belong.

FREDENBURG, R.: The committee statement for this proposal is that the proposal would conflict with 6.2.2 (4). This section deals with indoor containers for engine fuel systems. The proposal was intended to deal with outdoor containers in the small confines of places such as cell tower sites or other tower sites. Section 6.2.2 (4) does not apply to outdoor installations. The committee statement does not deal with the subject of the proposal and the proposal should be reconsidered at the proposal level.

KASTANAS, S.: The section conflict is not clear when the concept is offering a mitigating safety alternative for safe location of containers relative to stationary engines. Revise to assure this level of compliance.

KING, J.: I do not support reducing the distances as specified in this proposal. However, providing a means of reducing the potential for an unanticipated, uncontrolled discharge of liquid propane would enhance safety considering motors at these sites may start without warning at any time. My comment on 58-153. The committee should revisit the subject of propane containers installed on cell tower sites.

Comment 58-131 the Comment on Proposal No. as 58-1. (This is the wrong reference. The correct reference follows this comment)

Submmitter: Technical Committee on Liquefied Petroleum Gases, Recommendation: Review entire document to: 1) Update any extracted material by preparing separate proposals to do so, and 2) review and update references to other organizations documents, by preparing proposal(s) as required.

Substansiation: To conform to the NFPA Regulations Governing Committee Projects.

Committee Meeting Action: Accept Number Eligible to Vote: 29 Ballot Results: Affirmative: 27 Ballot Not Returned: 2 Bogosian, Jr., V., Sutton, M.
Comment 58-134 related comment to 58-131

58-134 Log #172  Final Action: Accept in Principle (11.14.1.6 (New))

Submitter: Richard G. Fredenburg, North Carolina Dept. of Agriculture & Consumer Services

Recommendation: Consider the previous committee action and add a new section 11.14.1.6 to read:
11.14.1.6 LP-Gas containers of 75 gallons water capacity or larger for stationary installations shall be located outside of buildings unless the buildings comply with the requirements of Chapter 10. Buildings or Structures Housing LP-Gas Distribution Facilities. This requirement shall apply to all new installations and to all existing installations one year after the adoption of this code.

Substantiation: Section 6.5.1 requires that “Liquid shall be transferred into containers, including containers mounted on vehicles, only outdoors or in structures specially designed for that purpose.” With that unqualified restriction, what is the purpose of having containers of 100 gallons propane capacity and larger inside buildings? They would have to be removed from the building to be filled and then returned after filling. This is not going to happen when the containers weigh nearly 600 pounds when full.

Committee Meeting Action: Accept in Principle

Committee Statement: Refer to committee statement on comment 58-131 (Log #CC4).

Number Eligible to Vote: 26
Ballot Results: Affirmative: 24 Negative: 1
Explanation of Negative:

Proposal 58-153 to related comment 58-134

58-153 Log #866  Final Action: Reject (11.14.1.6)

Submitter: Richard G. Fredenburg, North Carolina Dept. of Agriculture & Consumer Services

Recommendation: Add a new section 11.14.1.6 to read:
11.14.1.6 LP-Gas containers for stationary installations shall be located outside of buildings unless the buildings comply with the requirements of Chapter 10. Buildings or Structures Housing LP-Gas Distribution Facilities. This requirement shall apply to all new installations and to all existing installations one year after the adoption of this code.

Substantiation: During a visit to a remote tower site, an installation with four 120-gallon containers inside a building was found. The building does not comply with NFPA 58 Chapter 10 requirements. Locating and filling these containers inside this building is a dangerous situation for any people and equipment at this site, especially the one who fills these containers. The requirement for these stationary containers to be located outdoors existed previously when chapter 11 information was part of chapter 6 (current format). When the chapter 11 material was pulled out of chapter 6 (for the 1992 edition), there was an error, in that the requirement for stationary containers to be outdoors or in chapter 10 compliant buildings was not included with the pulled out material.

Committee Meeting Action: Reject

Committee Statement: This proposal would conflict with 6.2.2 (4).

Number Eligible to Vote: 29
Ballot Results: Affirmative: 21 Negative: 6
Explanation of Negative:
BELKE, J.: I agree with the proposal and don’t see any conflict with 6.2.2(4).

CZISCHKE, R.: We believe the committee should reconsider rejection of the subject proposal. It has always been a basic tenet to limit the amount of propane in buildings. In fact portable engine systems are only allowed indoors in an emergency in accordance with 11.14.1.1, so why would we want to allow stationary engine generators, which may have larger containers, to be installed indoors. We should accept in part or in principle proposal 58-153 and also revise 6.2.2 (4) to allow containers indoors only in emergency situations.

FREDENBURG, R.: The committee statement for this proposal is that the proposal would conflict with 6.2.2(4). If the containers are allowed to be located in structures that do not comply with Chapter 10, then they may not be filled. Section 6.5.1 states that “Liquid shall be transferred into containers … only outdoors or in structures specially designed for that purpose.” It does not make sense to allow a container to be located in a building if it may not be filled there. Maybe it would make sense to revise 6.2.2(4) to specify that only those containers that can be moved outdoors for filling may be installed indoors unless they are in Chapter 10 buildings.

Comment 58-135 related comment to Comment 58-131


Submitter: Ronald R. Czischke, Underwriters Laboratories Inc

Recommendation: Revise text as follows:
New 11.14.1.6 Containers for stationary engines installed outdoors shall be installed to meet the separation requirements of Section 6.3, except as modified in section 11.14.1.7. This requirement shall apply to all new installations and to all existing installations within one year of adoption of this code.

Substantiation: See my comment on 58-133. It has always been a basic tenet of the technical committee to limit the amount of propane in buildings. Paragraph 11.14.1.6 is needed to ensure proper separation distances in accordance with chapter 6 are maintained. An exception to 11.14.1.6 is provided when a shutoff valve is used in conjunction with a filler valve to limit the amount of propane release upon disconnection of the transfer hose. These paragraphs would not be in conflict with 6.2.2(4) if proposal 58-153 is accepted. NFPA 58 code has always restricted the use of propane indoors to very limited cases as covered by 6.19.1.2(A).

Committee Meeting Action: Accept in Principle in Part

The proposed 11.14.1.7 is not accepted because the committee has determined that the use of a fill valve with an integral shutoff will not impact the separation distances.

Committee Statement: Refer to committee statement on comments 58-131(Log #CC4) and 58-74 (Log #CC5).

Number Eligible to Vote: 26
Ballot Results: Affirmative: 23 Negative: 2
Explanation of Negative:

MCTIER, S.: This proposal should be totally rejected and referred to 58-131 instead of APP.
58-74 Log #CC5  Final Action: Accept

(6.2.2)

Submitter: Technical Committee on Liquefied Petroleum Gases,
Comment on Proposal No: 58-1
Recommendation: Revise Paragraph 6.2.2 to read:

6.2.2 LP-Gas containers shall be allowed in buildings only for the following applications:
(1) through (3), Unchanged
(4) Containers used with LP-Gas stationary or portable engine fuel systems shall comply with Chapter 11 comply with 11.14.1.
(5) Containers used with LP-Gas stationary engine fuel systems shall comply with 11.14.2.

Substantiation: This revision to Chapter 6 recognizes changes made in comment cc 4 which clarify the installation of containers serving engines in buildings.

Committee Meeting Action: Accept
Number Eligible to Vote: 26
Ballot Results: Affirmative: 24 Negative: 1
Ballot Not Returned: 1 Garza-Obregon, C.

Explanation of Negative:

Comment on Affirmative:
FREDENBURG, R.: There should be a reference to comment 58-131 (log #CC4) for the wording for section 11.14.2, as that is the only place one could find that section.
1. It was kind of a little too spread out to tell.

2. All those in favor of the motion, please stand. You may be seated. All those opposed to the motion, please stand. Thank you. You may be seated.

3. The vote was 66 for and 35 against. The motion carries.

4. Okay. Motion 58-6, the next on our docket on NFPA 58, appeared on our agenda. However, the authorized maker of the motion has notified NFPA that they no longer wish to present this motion.

5. Therefore, in accordance with NFPA rules, Convention Rules 2.6, the motion may not be considered by the assembly and is removed from the agenda. We will now move on to the next motion, that motion being Motion 58-7.

6. MR. FREDENBURG: Richard Fredenburg, North Carolina Department of Agriculture and Consumer Services, Standards Division. I move that proposal 58-154 be accepted. However, I wish to make a slight modification to it during the discussion.

7. MR. JARD: But before I rule on whether or not we're going to entertain that modified motion, can you please explain how you want to modify your motion?

8. MR. FREDENBURG: We would not include the
1 retroactivity part.

   MR. JARD: Can you be more specific with the wording, please? Sir, we simply need to get the words on the record, what you want to modify.

   MR. MORTIMER: If I could.

   MR. JARD: Sure. Go ahead, Mr. Mortimer.

   MR. MORTIMER: I believe the section he would like to not include is in Comment 58-154. And it says, "This requirement shall apply to all new installations and to existing installations within one year of the adoption of this Code. I believe that's the part Richard would like to not include in his motion. Am I correct, Richard?

   MR. FREDENBURG: That's correct.

   MR. JARD: Okay. So the motion is -- and let me restate it is we have it straight -- to accept your proposal 58-154 and then omitting the words "and to all existing installations within one year from adoption of this code"; is that correct?

   MR. FREDENBURG: Almost. "Eliminating and to all existing installations within one year of adoption of this Code."

   MR. JARD: Okay. The modification of proposal is at the discretion of this chair, and I am inclined to allow the motion, provided there is no
objection from the body. Is there a second for the motion? Okay. Seeing no one offered any objection, please proceed.

MR. FREDENBURG: Actually, the first part of that sentence would become unnecessary because it would automatically apply to all new installations. So we can strike that whole second sentence where it says, "This requirement shall apply to all new installations and to all existing installations within one year of adoption of this Code," strike that whole sentence from my motion.

MR. JARD: So you're stating you wish to further modify your motion?

MR. FREDENBURG: I'm clarifying what I want, yes.

MR. JARD: Can you please restate how you want the text to read?

MR. FREDENBURG: The text would then read, "Containers for stationary engines shall be installed to meet the separation requirements of section 16.3 except as modified in Section 11.14.17."

And then the second part would read, "Where containers for stationary engines having a fill valve with an integral manual shutoff valve, the minimum separation distances shall be one-half of the
MR. JARD: So your motion then -- okay, sir, I understand how you modified your modification. And again I'm going to be inclined to allow it as long as we get a second for that modification. We have a second. Please proceed.

MR. FREDENBURG: The chapter on engine fuel systems was created in the 1992 edition of the LP gas code. It was pulled mostly from the chapter on LP gas system installations. And in that chapter there were requirements for separation where containers for stationary engines were installed.

When the engine fuel systems were pulled out of the installations chapter 18 years ago, separation requirements from that chapter no longer applied to the containers for engine fuel because of scope statements.

For vehicle-mounted containers, new location and separation requirements were developed. This has not happened for stationary engines and their container. And it has not been a problem because there were relatively few stationary engine installations.

With the new interest in using propane for fuel or remote site power generators for various
agriculture stationary engines and for home emergency
generators, we realized that the separation
requirements for these containers cannot be enforced
because the LP gas code has no separation
requirements that apply.

The installer of a home emergency generator
could have the 500 or 1,000 gallon tank placed right
besides the house if the tank serves the generator
only. But the same size propane tank would have to
be at least 10 feet from the house if the gases is
using for cooking and heating.

This proposal is intended to require the
separation distances for all propane tanks that have
been required in NFPA 58 since the 1930's. It gives
installations to have an added safety feature of a
manual shutoff valve built into the fill valve by
allowing the separation distances to be halved. This
recognizes the limited space available in crowded
cell phone tower sites where propane power emergency
generators are becoming common.

I want to point out that the Committee
statement for rejecting this proposal simply said
that it, quote, is in conflict with 6.2.2(4),
unquote. That paragraph states that engine fuel
containers are allowed in buildings. There was
absolutely no technical justification for the rejection. No argument against the proposal was stated. It is clear to me that some separation between containers and buildings, especially dwellings, is essential.

MR. JARD: Okay. We'll open up debate on this motion as modified. Mr. Mortimer?

MR. MORTIMER: Yes. The motion that has been made is not without merit. And as I have it here changed, 11.14.16 reads, "Containers for stationary engines installed outdoors shall be installed to meet the separation requirements of Section 16.3 except as modified in Section 11.14.17."

Section 11.14.17 then states, "Where containers for stationary engines have a fill valve with an internal manual shutoff valve, the minimum separation distances shall be one-half of the distances specified in Section 6.3."

And that would be consistent with two other motions that the Committee had addressed. There would be no reason to oppose it.

MR. JARD: Thank you, Mr. Mortimer. Is there any further discussion on this motion? Okay. Seeing none, we'll move to a vote on the motion on the floor. And let me restate that motion is to
accept Proposal 58-154 as modified. That modification is to omit the sentence, "This requirement shall apply to all new installations and to all existing installations within one year of adoption of this Code."

All in favor of the motion, please raise your hand. Thank you. All opposed. The motion carries.

Okay. With that, we'll move on to our Motion Sequence Number 58-8. Microphone Number 3, please.

MR. FREDENBURG: Richard Fredenburg, North Carolina Department of Agriculture and Consumer Services, Standards Division. I move that Comment 58-37 be accepted.

MR. JARD: Is there a second?

UNIDENTIFIED SPEAKER: Second.

MR. JARD: There is a second. Please proceed.

MR. FREDENBURG: I am a state official in charge of an LP gas inspection program. I submitted the proposal in an attempt to ensure that the responsible safety inspections on large propane storage installations are performed in all states. Some states do not have an active inspection program.
Joshua W. Elvove, US General Services Administration

Revise Table 8.1 and Section 8.3 as follows:

***Insert Table 8.1 here***

8.3.1 Testing.

8.3.1.1 Frequency

8.3.1.1.1 Diesel engine driven fire pumps shall be operated weekly.

8.3.1.1.2 Electric motor driven fire pumps shall be operated monthly.

8.3.2 No-Flow Condition

8.3.2.1 A weekly test of fire pump assemblies shall be conducted without flowing water.

8.3.2.2 The weekly test shall be conducted by starting the pump automatically.

8.3.2.3 The electric pump shall run a minimum of 10 minutes.

8.3.2.4 The diesel pump shall run a minimum of 30 minutes.

8.3.2.5 A valve installed to open as a safety feature shall be permitted to discharge water.

8.3.2.6 The automatic weekly test timer shall be permitted to be substituted for the starting procedure.

8.3.2 Weekly Tests.

8.3.2.7 Qualified operating personnel shall be in attendance during whenever the weekly pump is in operation.

8.3.3 Annual Flow Testing

Table A.8.3.2.2 Weekly Observations — While Pumping

Substantiation: Proposal 25-133 aimed to decrease the no-flow test frequency for all fire pumps from weekly to monthly. After a spirited debate, the technical committee decided to reject the proposal and maintain the weekly no-flow test frequency. Most of the discussion centered on potential problems with diesel engine drivers. Therefore, this comment proposes to limit the monthly test only to electric motor driven fire pumps. The two issues raised by the technical committee in their substantiation to reject this proposal that pertained to electric motor driven pumps were 1) vulnerability to lightning and 2) loss of power phase. Facilities located in areas not subject to lightning should not be subject to more stringent requirements that wouldn’t normally apply. There are power reliability statistics that support the claim that when lightning damages an electric service, the extent of the damage is not limited to the fire pump only. The damage is quite obvious and a responsible assessment of lightning damage would include examination and testing of the fire pump system anyway. Hence, this should not be grounds for establishing a weekly test frequency. But in deference to the risk posed by lightning, a new annex has been provided that suggests increasing the testing frequency in areas subject to lightning. Loss of phase should not be a concern, since NFPA 20 requires monitoring for loss of phase (and loss of power) for all electric motor driven controllers. In response to issues concerning the pump itself, this comment retains all the weekly visual inspection requirements under Section 8.2 to ensure all items related to the pump prior to water flow testing are inspected weekly (e.g., packing flow, pressuring sensing circuits/gages, alignment, etc.). The casing relief only needs to be verified when the pump is operated and the pump frequency has no bearing on the valve’s functionality. Moreover, Armstrong Pump, a casing relief manufacturer, has indicated that poorly set casing relief valves can cause irreparable damage to gaskets and o-rings such that excessive pump testing can actually be more detrimental to a pump if the valves are not set properly.

Requiring new data to justify changing the current weekly test frequency to monthly is unjust and unfair. Unjust, because the weekly requirement became the de facto requirement without any test data to substantiate these frequencies in the first place. Unfair because obtaining new test data is virtually impossible, since AHJs don’t generally permit deviations to existing standards, given the liability it involves. To my knowledge, the only known entities that permit less frequent testing are the Department of Defense (DOD) and Australia. DOD (since 2001) permits monthly testing of diesel engine and electric motor fire pumps; Australia (since 2005) only permits electric motor fire pumps to be tested monthly. In neither case have there been any papers written to indicate that there has been an increased risk to fire pump or sprinkler performance because of these increased test frequencies. NFPA standards are supposed to be minimum standards. As currently written, the weekly test requirement is basically a maximum standard (unless there is a...
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<thead>
<tr>
<th>Table 8.1 Summary of Fire Pump Inspection, Testing, and Maintenance</th>
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<td><strong>Item</strong></td>
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<td>Inspection</td>
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<td>Pump house, heating ventilating</td>
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<td>- Diesel engine driven fire pump</td>
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<td>- Electric motor driven fire pump</td>
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<td>Flow condition</td>
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desire to test pumps on a daily basis). Even if the test frequency is increased to monthly, AHJs, property owners and insurers will always have the option of increasing requirements (i.e., decreasing test frequencies) if desired or conditions warrant. It’s time to make this change; if evidence appears to the contrary, the frequency could always revert back to weekly.

All other changes to text are merely formatting changes.

Committee Meeting Action: Accept

Number Eligible to Vote: 30

Ballot Results: Affirmative: 22 Negative: 7

Ballot Not Returned: 1 Fuller, D.

Explanation of Negative:

ADAMS, C.: Action should be to reject. The substantiation is based solely on the drive unit to change operation to monthly. Although the drive unit is critical, failures are more likely to take place with the pump particularly with the packing.

DRYSDALE, M.: While it was reported that performance data exists, it was not reviewed as part of this review cycle. Without performance data, the change is not justified.

MOORE, F.: Without a positive recommendation from the NFPA-20 committee on Fire Pumps, I do not feel our Technical Committee can only require a monthly pump exercise on electric fire pumps. The economic savings of 15 minutes a week does not justify the possibility of possible pump failure with life safety issues at stake. Perhaps future reliability data from DOD and Australia where monthly inspections are being tried would help in the future. A weekly visual and exercise of the Fire Protection pumping equipment is more important than our weekly failure data indicates. I am curious if UL listings and FM approvals of Fire Pumps will OK the product reliability for the Pump Manufacturers on a monthly exercise minimum requirement.

RAY, R.: This comment should be rejected as it was at the ROP meetings. At the ROC meetings, insurance company representatives were queried as to their loss experiences due to electric fire pumps not starting when needed: one rep mentioned some 70 failures many traced to coils on contactors (the coils can be inoperable due to electrical or other damage yet the green light on the controller erroneously indicates the pump is ready); another rep mentioned that they see “problems with contactor coils” and “old” controllers, of which there are many, many in the field today. The committee statement in regard to electric fire pumps at the ROP level was 100% correct and should have resulted in the rejection of this comment. The comment submitter’s substantiation makes little sense: the mere fact that other entities (DOD and Australia) permit less frequent testing means nothing at all since no data has been submitted to indicate that this less frequent testing has resulted in less failures. Also, the current weekly requirement brings “fire protection” to the forefront of property owners’ minds weekly and has resulted in the fact that our customers that perform weekly electric fire pump service have developed unparalleled maintenance programs as a result. Also, fire pumps are readily accessible to many other trades (alarm companies, backflow testing companies, etc) and the chance to discover “man made” mistakes goes from 52 times to only 12 times per year if this comment is accepted. Also, running fresh water weekly through the fire pump packings, glands and relief valve helps these devices from being subject to sediment build-up and extends their life expectancies.

SHEPPARD, J.: Would consider bi-weekly for electric pumps as a first step. No performance data to substantiate proposal.

UNDERWOOD, D.: DO NOT AGREE IN THAT WE HAVE FOUND MOTOR STARTER COILS INOPERABLE & THERE IS NO WAY TO MONITOR, BUT AS A FIRST STEP WOULD AGREE WITH BI WEEKLY UNTIL MORE DATA IS FOUND.

VICTOR, T.: Although the submitter attempted to address the need to relax this frequency point by point, there was no real evidence provided that electric fire pumps are as reliable when exercised once a month instead of once a week.

Comment on Affirmative:

BELL, K.: Editorially, I believe the word “during” should be removed in 8.3.2.7.

ELVOVE, J.: Testing is currently being conducted monthly by DOD and in Australia. NFPA 25 is supposed to be a minimum standard. The current weekly requirement is far from minimum - unless one wishes to test electric motor driven fire pumps even more frequently (daily?). The concerns over problems with contactor coils seemed to apply to older controllers, not newer models. An AHJ or insurer can always require more frequent testing than the proposed monthly requirement, if there are concerns with older controllers or if there are any other concerns. Monthly testing does not obviate the existing requirement to conduct weekly inspections of pump house, pump system and electrical system conditions as required by 8.2.2.

MUNNO, J.: Monthly operation of electric fire pumps has provided acceptable reliability within many industries.
25-70 Log #103

Final Action: Accept in Principle in Part

(8.3.1)

Submitter: Frank L. Van Overmeiren, FP&C Consultants, Inc.

Comment on Proposal No: 25-133

Recommendation: Revise text to read as follows:

8.3.2 A monthly test of the fire pump assemblies shall be conducted without flowing water.

Substantiation: Extensive technical data was previously submitted during the 2006 Fall Revision Code Cycle and is available for review at NFPA Headquarters. See Report on Comments 25-31, Log #16, Comment on Proposal No. 25-110.

Inspection and test data was collected from 94 facilities representing 61,070 weekly inspection and test events. A total of 227 failures or deficiencies were noted representing a total failure rate of 0.37 percent. Of the 227 total failures, 201 failures were noted as leaking packaging, dry packaging or a leaking pressure relief valve type of event which would not seriously effect the initial operation of the fire pump. Of the 227 total failures, 2 failures were noted as overheating and misalignment and were discovered during the first weekly inspection after initial installation or major repair work. These failures should be documented as improper installation fire pump inspection and testing and not weekly event failures. The remaining 24 failures noted represent a failure rate of 0.04 percent, where closed valves, dead batteries, controller malfunction, switch adjustment and worn bearing conditions would effect the initial operation of the fire pump. A failure rate of 0.04 percent for a fire and life safety feature is insignificant and identifies an inspection and testing frequency that is excessive and a cost burden. The industry standard requirement for fire pump inspection and testing frequencies should be changed from weekly to monthly.

Committee Meeting Action: Accept in Principle in Part

See Committee Action on Comments 25-71 (Log #79) and 25-68 (Log #112).

Committee Statement: The data submitted last cycle was limited and not sufficient to overcome committee concerns over diesel engine components. Committee Action on Comment 25-71 (Log #79) addresses this issue for electric drivers.

Number Eligible to Vote: 30

Ballot Results: Affirmative: 21 Negative: 8

Ballot Not Returned: 1 Fuller, D.

Explanation of Negative:


LARRIMER, P.: Agree with the commenter. The committee’s concerns did not rise to the level of providing convincing evidence that diesel pumps required a weekly run test.


RAY, R.: This comment should be rejected as it was at the ROP meetings. At the ROC meetings, insurance company representatives were queried as to their loss experiences due to electric fire pumps not starting when needed: one rep mentioned some 70 failures many traced to coils on contactors (the coils can be inoperable due to electrical or other damage yet the green light on the controller erroneously indicates the pump is ready); another rep mentioned that they see “problems with contactor coils” and “old” controllers, of which there are many, many in the field today. The committee statement in regard to electric fire pumps at the ROP level was 100% correct and should have resulted in the rejection of this comment. The comment submitter’s substantiation makes little sense: the mere fact that other entities (DOD and Australia) permit less frequent testing means nothing at all since no data has been submitted to indicate that this less frequent testing has resulted in less failures. Also, the current weekly requirement brings “fire protection” to the forefront of property owners’ minds weekly and has resulted in the fact that our customers that perform weekly electric fire pump service have developed unparalleled maintenance programs as a result. Also, fire pumps are readily accessible to many other trades (alarm companies, backflow testing companies, etc) and the chance to discover “man made” mistakes goes from 52 times to only 12 times per year if this comment is accepted. Also, running fresh water weekly through the fire pump packings, glands and relief valve helps these devices from being subject to sediment build-up and extends their life expectancies.

SAIDI, J.: Do not agree with committee action. The submitter’s substantiation was correct and should have been accepted. See my comments on 25-50.

SHEPPARD, J.: See my comment for 25-68.


VICTOR, T.: The submitter provided statistics that in my opinion proved the need to continue weekly pump tests. A low failure rate does not mean a less frequent test will have the same positive results. Of the failures noted in these
statistics, a majority were for reasons the technical committee stated as ones for leaving the frequency at weekly: leaking packing, dry packing, or a leaking pressure relief valve.
25-71     Log #79     Final Action: Accept in Principle in Part
(8.3.1 and Table 8.1)

Submitter: Michael A. Anthony, University of Michigan
Comment on Proposal No: 25-133
Recommendation: New text to read as follows:
Accept the Proposal, as written.

Substantiation:  1. There was no new data submitted to support the reduction in test frequency. There is no data to support the existing language, either. The fact that the requirement exists should bear the same burden of proof as challenges to the requirement. In other words, the fact that we now have a weekly testing requirement for all occupancies under all types of management structures should not be regarded as its own technical substantiation. To wit, the only countable data available is the number of interest groups that benefit from frequent test intervals.

NFPA 25 is not the only committee that labors under ambiguity of practical intent, however. The following excerpt from the NFPA Rules Governing Committee Projects should make it plain that "substantiation" itself is not substantiated.

4.3.3 Content of Proposals. Each Proposal shall be submitted to the Council Secretary and shall include the following:
(a) Identification of the submitter and his or her affiliation (i.e., TC, organization, company), where appropriate
(c) Proposed text of the Proposal, including the wording to be added, revised (and how revised), or deleted
(d) Statement of the problem and substantiation for Proposal [Emphasis added]
(e) The signature of the submitter or other means of authentication approved by the Council Secretary
(f) Two copies of any document(s) (other than an NFPA document) being proposed as a reference standard or publication (see 3.3.7)

There is no other statement about the criterion for substantiation in the NFPA regulations. There may be a more granular definition of what constitutes technical substantiation farther upstream in an ANSI standards-developing-guidance document but we have to assume that NFPA's implementation of the ANSI process leaves the determination of substantiation in the eye of the committee. Assuming that the use of the phrase "no new data" implies a criterion for substantiation, we believe that the lack of data is neither a necessary nor a sufficient condition for the rejection of this proposal.

Let's move on to other parts of the committee statement.

2. Fire pumps are standby systems that are critical to life safety that are normally in a standby condition (not normally started or run). The only means of detecting many failures is through running the pump. The weekly test frequency is consistent with other water supply inspections and tests. The committee feels that waiting in excess of 7 days to detect a fire protection water supply deficiency (including pumps, tanks, pressures, etc.) is unacceptable.

As for the claim that fire pumps are special because they are a "standby system": Egress lighting and fire doors are also standby systems. Electrical circuit breakers are also "standby systems"; many of them only called upon to operate once or twice in 50 years--if ever. Most of them do operate; so do automobile air bags. All life safety infrastructure is a standby system. Standby systems technology has as its core characteristic high nine availability. The materials, mechanisms, controls, installation and testing methods must be designed and installed to withstand a variety of environmental and operational conditions over a long period of time.

3. Pump needs regular exercise to ensure packing flow is sufficient to lubricate shaft and to cool bearings.

If the pump needs this much exercise to ensure packing flow, the fire pump industry should observe how the automobile industry innovated--actually competed within itself--to spread out lubrication intervals to increase engine life and reduce the cost of maintenance.

4. Verify casing relief valve functionality .

Same as above, though we should recognize the frequency of maintenance-induced errors when test valves are not restored to their normal condition after a test has been completed. In this case, the weekly test actually reduces availability and can cause some first class damage to the system.

5. Verify pressure sensing circuit (both mechanically and electrically ).

Same as above

6. Ensures that the controller starting circuit is functional.

Same as above

7. Identifies problems of alignment.

Alignment changes are extremely rare. These do not change week-to-week. A monthly, or even semi-annual would be more appropriate and risk-informed.
A. Electric pump specific issues:

Electric pumps are particularly vulnerable to lightning and voltage surges since the main contactor coil and relays connected directly to the incoming power line.

Is the committee in possession of loss data that reports fire pump motors damaged by lightning? If there is, then perhaps a requirement for surge protection devices applied at electric services may be in order; though most fire pump controllers have plenty of annunciation features if the fire pump is damaged. Otherwise lightning damage is possible -- but not statistically probable -- to be relevant to this discussion. Two other points:

a. Typically, lightning does damage to more than just the fire pump; the entire service is affected and a weekly no-flow test is irrelevant.

b. Lightning is more likely to damage fire pumps in isolated areas where diesel fire pumps are specified because the utility service does not have the capacity to handle locked-rotor-current (such as in rural, or ex-urban industrial districts). Thus, it is less likely that an electric fire pump would even be present in a place where lightning damage is most likely to damage it.

Verifies that all three power phases are available (at many locations the fire pump is the only three phase load).

Same as above: possible but not probable; mitigated by the fact when a phase is dropped or open at the utility level, the event usually has a signature that is recognizable with phase-loss-detectors. Most controllers already have this per NFPA 20.

Diesel pump specific issues:

Monthly testing of the diesel engine is not appropriate per the manufacturers.

With this as substantiation, the practical effect is to maintain the status quo: without fire pump system manufacturers having any incentive to innovate more reliable products if they can push the total cost of ownership into O&M budgets.

Some engines are vulnerable to loss of fuel prime if not run regularly.

With this as substantiation, the practical effect is to maintain the status quo: without fire pump system manufacturers having any incentive to innovate more reliable products if they can push the total cost of ownership into O&M budgets.

The weekly 30-minute test accomplishes the following:

1. Proves the engine can start and produce power.

With this as substantiation, the practical effect is to maintain the status quo: without fire pump system manufacturers having any incentive to innovate more reliable products if they can push the total cost of ownership into O&M budgets.

2. Renews the oil film on internal parts to prevent wear and corrosion.

With this as substantiation, the practical effect is to maintain the status quo: without fire pump system manufacturers having any incentive to innovate more reliable products if they can push the total cost of ownership into O&M.

3. Drives off condensation in the lubrication and exhaust systems.

With this as substantiation, the practical effect is to maintain the status quo: without fire pump system manufacturers having any incentive to innovate more reliable products if they can push the total cost of ownership into O&M.

4. Loads the engine cooling system for sufficient duration to detect if a there is a problem.

With this as substantiation, the practical effect is to maintain the status quo: without fire pump system manufacturers having any incentive to innovate more reliable products if they can push the total cost of ownership into O&M.

Why Gensets are different:

Most critical applications have a UPS system (battery) in addition to the genset.

This part of the committee statement is difficult to understand.

The fire pump service is more severe.

See statement above regarding the availability of standby systems.

Fire pumps are under load from the first revolution of the pump up to rated speed.

This part of the committee statement is difficult to understand.

Fire pump systems are much more complex than gensets due to the many redundant operational features that must also be verified as being operational.

Complex systems -- whether it is a component or an assembly of components field installed within a larger network of dependent variables -- do not have constant failure rates. The familiar bathtub curve, shown below, should make this clear.

***Insert Figure 1 here***

Summary:

If it is data that is needed in this substantiation, then a second item of easily countable piece of data is the number of proposals from executive facility managers of large building assets that assert that the cost of weekly churn tests for all occupancy types, under all management structures, is out of proportion to its benefit. Say you are a large university plant operations department running 50 million square feet, with 100 fire pumps and are obligated by your
insurance company to conform to industry standards for 10 different life safety systems (egress lighting, generators, fire doors, etc.) and the weekly churn test consumes 25 percent of your inspection, testing and maintenance budget across ten different life safety systems. You will be looking for ways to use limited funding more effectively by scaling your testing efforts according to risk and you will be looking to pay more up front for a product and/or installed system that reduces long-term O&M costs.

O&M costs are in the range of 80% of the total cost of ownership of a building. The funding to maintain the life safety infrastructure is not keeping pace with the accelerating complexity of smart building life safety infrastructure and the complexity of the codes and standards that govern their upkeep. While we recognize that NFPA 25 presents a generic "equivalent performance clause" (as do all other NFPA documents) this committee must already be aware that the practical effect of the testing intervals in Section 8.1 is prescriptive conformity -- especially in jurisdictions without the resources to support performance methods. Prescriptive methods may be in the interest of safety -- statistically -- but there are parts of the US economy -- large parts -- where, the Table 8.1 testing requirements impedes effective rationalizing/balancing of risk across all life safety infrastructure systems.

With permanent full-time maintenance, fire pump and sprinkler system complexities may be managed according to the occupancy class of the facility and the life-cycle of the system. Facility managers in our industry would like to rationalize their testing resources so that, for example, a new fire pump system commissioned within the past year receives semi-annual no-flow testing, while a 50-year old fire pump system receives monthly testing.

We recognize and appreciate the work the committee put into its substantiation of our proposal. We are similarly grateful that the NFPA process allows topics like this to be publicly vetted. Sometimes technical committees, when put around a table face-to-face, have a better ideas than Proposers and Commenters about what compromise language will satisfy all interest groups. APPA will be grateful for any modification of the weekly testing requirement that contains some leeway for the testing interval to be more informed by occupancy risk, by its point on the bathtub curve representing system life-cycle, and by the presence of a full-time, trained and certified maintenance staff.

Standards like NFPA 25 are not just technical documents. Because they are written as model law, they are vehicles of compliance. Because they are written as model law, they are vehicles of safety and economy.

Committee Meeting Action: Accept in Principle in Part
Accepting the proposed revisions for electric pumps. (See Committee Action on Comment 25-68 (Log #112))

Rejecting proposed revisions for diesel engine pumps

Committee Statement: The committee action on Comment 25-68 (Log #112) addresses the changes for electric pumps. But the committee knows that there are significant concerns with the maintenance of diesel engines based on the manufacturers recommendations.

Number Eligible to Vote: 30
Ballot Results: Affirmative: 21 Negative: 8
Ballot Not Returned: 1 Fuller, D.

Explanation of Negative:
ADAMS, C.: Action should be to reject. See remarks on Comment 25-68 (Log #112) reasoning. Procedures are provided to substantiate alternate frequencies in 25 - 4.6.1.1.


LARRIMER, P.: See my comment on 25-70.

RAY, R.: This comment should be rejected as it was at the ROP meetings. At the ROC meetings, insurance company representatives were queried as to their loss experiences due to electric fire pumps not starting when needed: one rep mentioned some 70 failures many traced to coils on contactors (the coils can be inoperable due to electrical or other damage yet the green light on the controller erroneously indicates the pump is ready); another rep mentioned that they see "problems with contactor coils" and "old" controllers, of which there are many, many in the field today. The committee statement in regard to electric fire pumps at the ROP level was 100% correct and should have resulted in the rejection of this comment. The comment submitter's substantiation makes little sense: the mere fact that other entities (DOD and Australia) permit less frequent testing means nothing at all since no data has been submitted to indicate that...
this less frequent testing has resulted in less failures. Also, the current weekly requirement brings “fire protection” to the forefront of property owners’ minds weekly and has resulted in the fact that our customers that perform weekly electric fire pump service have developed unparalleled maintenance programs as a result. Also, fire pumps are readily accessible to many other trades (alarm companies, backflow testing companies, etc) and the chance to discover “man made” mistakes goes from 52 times to only 12 times per year if this comment is accepted. Also, running fresh water weekly through the fire pump packings, glands and relief valve helps these devices from being subject to sediment build-up and extends their life expectancies.

SAIDI, J.: Do not agree with committee action. The submitter’s substantiation was correct and should have been accepted.

SHEPPARD, J.: See my comment for 25-68.


VICTOR, T.: Although the submitter attempted to address the need to relax this frequency point by point, there was no real evidence provided that electric fire pumps are as reliable when exercised once a month instead of once a week.
Submitter: Richard J. Davis, The Evergreen State College
Comment on Proposal No: 25-133

Recommendation: New text to read as follows:
Add new section 8.3.1.1 and annex note as follows:

Monthly testing shall be permitted if consecutive weekly tests for one quarter (i.e., 13 consecutive weeks results in the pump starting and operating continuously for the duration of the test. Testing will revert to weekly following a failure to start or operational failure.

A.8.3.1.1. Examples of operational failures would be excessively leaking packing glands, drop in pressure, grinding of bearings, etc.

Substantiation: Rebuttal to Committee Action:
The primary motivation for establishing an interval for fire pump testing is decreasing loss of life and property by fire. Specifically, the goal is to establish a high confidence that fire pumps will operate when needed, at the instance following the previous test when a control sequence attempts to initiate performance.

Component manufacturers study, test and collect data on failures, and can establish tests that reveal the likelihood of failure. However, the committee and the proponents of changing the test frequency have been unsuccessful in finding published data that offers clear guidance on appropriate test intervals for finished assemblies that contain many components, such as fire pumps.

The question is: At what test interval is the probability that the pump will start on the next attempt be at a maximum? Because the life of a component can suffer degradation and loss of reliability based on time (corrosion, oxidation, loss of lubrication, and loss of charge) and use (fatigue and wear related failures), choosing optimum test intervals for systems which include batteries, starters, switches, relays and other components lacks simplicity. The committee, by rejecting Mr. Anthony’s proposal, is concluding that in the presence of uncertainty, the costly alternative of frequent testing is prudent. Perhaps the conclusion reached to date is that many successful tests in a short period provide the best outcome. Consistent with this is the conclusion that past success outweighs the growing risk of a failure from component fatigue or other failure that is substantially use related. Until better data are developed, the committee should consider permitting monthly testing provided that there have been no failures to start in recent tests. Likewise, weekly testing is required following a failure to start until there is operational evidence (such as successful and consecutive starts for a quarter of a year), following which monthly testing may resume.

Committee Meeting Action: Accept in Principle
Committee Statement: Committee action on Comment 25-68 (Log #112) addresses this issue. Furthermore, the standard already acknowledges in 4.6.1.1.1 the use of performance based evaluations to alter ITM frequencies, based on the consideration of numerous variables.

Number Eligible to Vote: 30
Ballot Results: Affirmative: 23 Negative: 6
Ballot Not Returned: 1 Fuller, D.

Explanation of Negative:
ADAMS, C.: Action should be to reject. See remarks on Comment 25-68 (Log #112) and Comment 25-71 (Log #79) reasoning.
MOORE, F.: See Comments in Log #112.
RAY, R.: This comment should be rejected as it was at the ROP meetings. At the ROC meetings, insurance company representatives were queried as to their loss experiences due to electric fire pumps not starting when needed: one rep mentioned some 70 failures many traced to coils on contactors (the coils can be inoperable due to electrical or other damage yet the green light on the controller erroneously indicates the pump is ready); another rep mentioned that they see “problems with contactor coils” and “old” controllers, of which there are many, many in the field today. The committee statement in regard to electric fire pumps at the ROP level was 100% correct and should have resulted in the rejection of this comment. The comment submitter’s substantiation makes little sense: the mere fact that other entities (DOD and Australia) permit less frequent testing means nothing at all since no data has been submitted to indicate that this less frequent testing has resulted in less failures. Also, the current weekly requirement brings “fire protection” to the forefront of property owners’ minds weekly and has resulted in the fact that our customers that perform weekly electric fire pump service have developed unparalleled maintenance programs as a result. Also, fire pumps are readily accessible to many other trades (alarm companies, backflow testing companies, etc) and the chance to discover “man
made” mistakes goes from 52 times to only 12 times per year if this comment is accepted. Also, running fresh water weekly through the fire pump packings, glands and relief valve helps these devices from being subject to sediment build-up and extends their life expectancies.

SHEPPARD, J.: See my comment for 25-68.

Comment on Affirmative:
ELVOVE, J.: This comment has merit, and is something that should be considered in the future for decreasing the frequency for testing diesel engine fire pumps from weekly to some other frequency.
Submitter: Michael A. Anthony, University of Michigan Business Operations

Recommendation: Revise text to read as follows:

8.3.1 A **weekly monthly** test of fire pump assemblies shall be conducted without flowing water.

Chapter 8 Fire Pumps

8.1* General.

This chapter shall provide the minimum requirements for the routine inspection, testing, and maintenance of fire pump assemblies. Table 8.1 shall be used to determine the minimum required frequencies for inspection, testing, and maintenance.

***Insert Table 8.1 Here***

Substantiation: Weekly no-flow ("churn tests") pose significant costs to the higher education industry where electric fire pumps are more the rule than the exception. Many local jurisdictions permit Owners and fire protection contractors to reduce the churn test frequency to every 30 days.

Acceptance of this proposal would bring this section of NFPA in harmony with what already appears to be industry practice. Acceptance does not restrict local authorities from asserting more rigorous, risk-informed testing intervals for special occupancies. The practical affect of reduction in the churn test frequency will permit limited funding for inspection, testing & maintenance to be applied to other areas of our life safety infrastructure in order to manage risks.

During the 2008 code-cycle the first change that was proposed by Atomic Energy of Canada (See ROP Log #1) was the reduction in testing frequency. To quote the one dissenting committee member, Mr Larrimer, someone whose position at the US Department of Veterans Affairs gives him access to a great deal of anecdotal/common knowledge/rule-of-thumb, information:

…”Standard for Emergency and Standby Power Systems” has required **monthly** testing for diesel driven emergency generators that are used to keep critically ill patients alive under power failure emergencies for many many years with great success. People are not dying because of the failure of the emergency generator systems, even when we all know just by reading the daily newspapers that utility power failures are very common across the country. Surely NFPA 25 can’t consider a fire pump for a sprinkler or spray system more important than a life saving emergency generator such that they would continue to require testing of a fire pump 52 times a year while the generator are tested 12 times per year. The anecdotal data from the successful operation of emergency generators during power failures across the country is sufficient in itself to reduce the fire pump testing to at least that which is acceptable for those systems that are critical for maintaining actual life support… systems

To quote Mr. Everitt of the Western Regional Fire Code Development Committee:

…The requirement for a weekly test is excessive. It does not ensure that the pump will be operational when needed. It only serves to wear the pump out faster increasing the need and expense for servicing, maintenance and repairs.

Having believed that this passed during the last code cycle, one organization went to monthly testing for about one and a half years. The monthly testing was adequate to ensure proper function of the pump…

In its substantiation rejecting each of these proposals, the committee of 25 eligible votes rejected the proposals on the basis of lack of substantiation. Does the committee have its own substantiation that the present testing frequencies result in proportional increases in fire safety? Would daily churn tests make fire pumps seven times safer? Life safety infrastructure on US college campuses is growing at an accelerating rate across multiple dimensions of people, processes and technology. The problem APPA members face is how to optimally balance risks for multi-building, mixed-occupancy campuses with a broad variety of disaster risk aggregations. Over-testing in one life safety infrastructure component makes another part of that infrastructure area less safe.

The US Department of Energy has been tracking this issue since 1998, and has joined the chorus of Owners rejecting the weekly no-flow testing requirement for more risk-informed testing frequencies. They reached the same conclusion in their own study:

*There is a general lack of available data on how previous and existing fire suppression system maintenance requirements were established. Several literature searches and discussions with technical experts in this area failed to reveal definitive research in this area. Failure rate data were obtained from several DOE sites, and some comparisons
<table>
<thead>
<tr>
<th>Item</th>
<th>Frequency</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump house, heating ventilating louvers</td>
<td>Weekly</td>
<td>8.2.2(1)</td>
</tr>
<tr>
<td>Fire pump system</td>
<td>Weekly</td>
<td>8.2.2(2)</td>
</tr>
<tr>
<td><strong>Test</strong></td>
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<tr>
<td>Pump operation</td>
<td></td>
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</tr>
<tr>
<td>No-flow condition</td>
<td>Weekly–[Monthly]</td>
<td>8.3.1</td>
</tr>
<tr>
<td>Flow condition</td>
<td>Annually</td>
<td>8.3.3.1</td>
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<td><strong>Maintenance</strong></td>
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<td>Hydraulic</td>
<td>Annually</td>
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<tr>
<td>Mechanical transmission</td>
<td>Annually</td>
<td>8.5</td>
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<td>Electrical system</td>
<td>Varies</td>
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<td>Controller, various components</td>
<td>Varies</td>
<td>8.5</td>
</tr>
<tr>
<td>Motor</td>
<td>Annually</td>
<td>8.5</td>
</tr>
<tr>
<td>Diesel engine system, various components</td>
<td>Varies</td>
<td>8.5</td>
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were made on the effects of changing testing frequencies in particular to see what failure rates would subsequently result. For the case where this was done the failure rates were actually worse at the site with the more frequent testing. In some cases, the best answers the Subcommittee was able to justify were that professional judgment and experience, as used by the NFPA committees in establishing the existing maintenance requirements, had to be used when establishing our own requirements. [Emphasis added]

--- Dennis Kubicki, P.E. Chairman DOE Fire Safety Committee, Department of Energy Implementation Guidance:


While modification of any NFPA requirement is an option available to any adopting jurisdiction, we believe that the present language in NFPA 25 concerning testing frequency weakens the credibility of the document. When an NFPA requirement is ignored as an exception, it creates a burden upon insurance companies and inspection authorities to acquire variances from the national standard. An incorrect or unreasonable standard, even if not adopted by a state, can be used by plaintiff’s counsel to establish a standard of care in a negligence claim. This creates an enormous burden on a defendant owner to prove that the standard is unreasonable or erroneous and should not be used, or that failure to follow the standard did not cause the particular harm alleged. The very clout and credibility enjoyed by the NFPA generally makes this legal problem worse.

Committee Meeting Action: Reject
Committee Statement: There was no new data submitted to support the reduction in test frequency.

Fire pumps are standby systems that are critical to life safety that are normally in a standby condition (not normally started or run). The only means of detecting many failures is through running the pump. The weekly test frequency is consistent with other water supply inspections and tests. The committee feels that waiting in excess of 7 days to detect a fire protection water supply deficiency (including pumps, tanks, pressures, etc.) is unacceptable.

Why you need to test the pump weekly?
- Pump needs regular exercise to ensure packing flow is sufficient to lubricate shaft and to cool bearings.
- Verifies casing relief valve functionality.
- Verify pressure sensing circuit (both mechanically and electrically).
- Ensures that the controller starting circuit is functional.
- Identifies problems of alignment.

Electric pump specific issues:
- Electric pumps are particularly vulnerable to lighting and voltage surges since the main contactor coil and relays connected directly to the incoming power line.
- Verifies that all three power phases are available (at many locations the fire pump is the only three phase load).

Diesel pump specific issues:
- Monthly testing of the diesel engine is not appropriate per the manufacturers.
- Some engines are vulnerable to loss of fuel prime if not run regularly.

The weekly 30-minute test accomplishes the following:
1. Proves the engine can start and produce power.
2. Renews the oil film on internal parts to prevent wear and corrosion.
3. Drives off condensation in the lubrication and exhaust systems.
4. Loads the engine cooling system for sufficient duration to detect if there is a problem.

Why Gensets are different:
- Most critical applications have a UPS system (battery) in addition to the genset.
- The fire pump service is more severe.
- Fire pumps are under load from the first revolution of the pump up to rated speed.
- Fire pump systems are much more complex than gensets due to the many redundant operational features that must also be verified as being operational.

Number Eligible to Vote: 30
Ballot Results: Affirmative: 26 Negative: 3
Ballot Not Returned: 1 Hoover, S.

Explanation of Negative:
ELVOVE, J.: It is clear that there are two steadfast perspectives on this topic with the majority siding with the current weekly test frequency for both electric and diesel driven fire pumps. Despite the proponents substantiation, the manufacturer’s information provided by Mr. Larrimer and the successful record of fire pump testing provided by Mr. Saidi, it is not clear what additional information can be presented to this committee in order to demonstrate that changing the fire pump test frequency from weekly to monthly does not impact on the reliability of the fire pump system (i.e., the water supply, pump and controller). Test data is difficult to obtain, because most AHJs do not permit fire pump owners to deviate from the existing weekly test requirements, even though there is a performance based test option per
4.6.1.1.1. If there is going to be even the remote possibility of decreasing fire pump test frequencies, AHJs such as the Joint Commission, CMS, local and state fire marshals, etc. will need to give due consideration to property owners so this data might be collected and presented to the committee in the future. Otherwise, there will be no way to make any change to current test frequencies, regardless of whether they were ever founded in the first place.

LARRIMER, P.: Significant substantiation has been provided for the change in frequencies and the committee statement provided little documented material to substantiate the existing frequencies. The “electrical pump specific issues” in the committee statement are very interesting. I am not aware that the VA has had any known problems with lightning strikes or voltage surges that affected the hundreds of electric drive pumps that we have nor do I understand how the weekly test will address that.

The following links provide the results of a quick search of the internet for fire pump O&M manuals. The manufacturer’s written documentation appears to recommend that “periodic” maintenance be done and if a frequency is stated, it say that fire pumps be run at a minimum frequency of monthly, not weekly. It appears that the NFPA requirements exceed the written manufacturers requirements.

http://www.pattersonpumps.com/PDFs/schedule%20packaged%20pumps.pdf

Though there may be times when some pumps should possibly be run more often than monthly, it doesn’t appear that that this is a typical recommendation by the manufacturers, nor should it be required for a minimum standard. The committee statement arguments for mandating weekly testing are unconvincing.

SAIDI, J.: Section 8.3.1

Rational for rejection of the proposal to change the “No-flow” weekly test to monthly relied primarily on the operation of the Diesel pumps. The minority view shared by myself and others regarding the need to make the distinction between the drivers (Diesel vs Electric motors) in adjusting this requirement did not receive sufficient consideration. There were no verifiable data to indicate that the change in this test for the electric motors had undesired consequences. Whereas, the experience at several DOE sites that had adopted the reduction of this testing frequency indicates a lower failure rate for those sites on the monthly test schedule.

Furthermore, the assertion that the electric pumps should be tested weekly due to their vulnerability to lightning and voltage surges is without any apparent supporting data.
underground piping, not just seek factor or the flow conditions. And certainly full flow backflow testing is one way to accomplish this as others that Mr. Leavitt enumerated. Thank you.

RALPH GERDES: Thank you.

Mr. Bouchard, any final comments?

JOHN BOUCHARD: No, I don't believe so. I will indicate, however, again, that Ken's comment was basically unanimously defeated, so just to give you a sense of what the committee was thinking. The committee is firmly behind its committee statements and action on this proposal.

RALPH GERDES: Okay. Thank you.

We'll proceed with the vote. The motion is to accept Comment 25-65. All those in favor, please raise your hands.

(Raising Hands.)

RALPH GERDES: Thank you.

All those opposed?

(Raising Hands.)

RALPH GERDES: That motion fails.

Moving on to motion sequence 25-13.

Microphone 5.

RICHARD RAY: My name's Richard Ray, Cyborg Fire Protection, Downers Grove, Illinois, member of the
technical committee.

What my motion is is to reinstate the requirement that electric fire pumps be churn tested weekly. This requirement.

RALPH GERDES: I'm sorry. Can you state your motion again?

RICHARD RAY: My motions is to reinstate the requirement that electrical fire pumps be churn tested weekly.

RALPH GERDES: Are you asking to reject Comment 25-68?

RICHARD RAY: Yes.

RALPH GERDES: And 70, 71, and 72?

RICHARD RAY: Correct.

RALPH GERDES: Okay.

RICHARD RAY: They grouped it.

(Second.)

RALPH GERDES: I hear a second.

Proceed.

RICHARD RAY: This requirement's weekly churn test of electrical fire pumps has been in NFPA 25 since the very first edition back in 1992, and it's been in every subsequent edition.

When we met in Salt Lake City back in January of '09 at the ROP meeting, this requirement was
attacked. Building owner types attacked it; the owner
group attacked it. The committee did the right thing
and they kept the requirement in the standard, and when
we left that meeting, electric fire pumps still had to
be churn tested weekly.

And the substantiations included: There was no
data submitted to substantiate changing to not do it
weekly. The pump is a very critical component and
spends most of its service life in stand-by mode.

Weekly testing of a fire pump is consistent
with other required inspections and tests of water
supplies. Waiting over -- this is a quote, waiting over
seven days to detect a problem is unacceptable to the
committee. And then an issue came up that I wasn't
really familiar with, but boy, did I learn a lot.

Electric fire pumps are vulnerable to these
voltage surges. They come alive, you know, an
electrical line or -- that's where (indiscernible) or
nearby lightening strike. And what can happen in these
controllers is a contactor [sic] coil gets burned out or
a relay gets burned out just from the induced current
that happens when lightening strikes. I am not an
electrician.

The fire pump controller doesn't look any
different after that contactor coil burns. It looks the

So we proceed to the ROC meeting. The requirement for weekly churn test fire pumps -- electrical fire pumps is attacked again. This time it was overturned and the requirement was removed and we went to monthly tests.

In my opinion, that was a big mistake. There was no data submitted to allow going from a weekly frequency to a monthly frequency. The whole issue of the electrical problems and the lightening strikes was discussed again.

In fact, some of the members of the committee who are involved in the insurance industry mentioned that they had been involved in losses in buildings because lightening had taken out a contact coil and the electric fire pump couldn't start, but still it was overturned.

My opinion is there's a lot of people, a lot of people go in and out of pump rooms -- fire pump rooms, lots of people. Sprinkler contractors, backflow testing companies, alarm companies, maintenance people, there's
1 a lot of people that go in and out of pump rooms. What
2 we're doing is we're losing the chance to make sure that
3 that electric pump is going to start from looking at it
4 52 times a year to 12 times a year.
5 The substantiation at the ROC was this: This
6 is what we lost, this is how we lost. This is what they
7 substantiated with: Australia does it. Australia
8 allows monthly churn tests. That was the
9 substantiation.
10 There was no data submitted going to less
11 frequent churn testing was good. No. They said well,
12 Australia does it. The swayed enough committee votes.
13 The sub -- the substantiation continued. If we screwed
14 up by reducing the frequency or by increasing the
15 frequency from weekly to monthly, then we can always --
16 RALPH GERDES: 45 seconds.
17 RICHARD RAY: Then we can always revert to
18 weekly down the road. So when do we do that? After we
19 lose one building? two buildings? three buildings? When
20 do we say enough?
21 We made a big mistake in Charlotte at the ROC
22 by losing the requirement to weekly churn test fire
23 pumps that have been in this book since the day it was
24 written. Thank you.
25 RALPH GERDES: Thank you.
1          Mr. Bouchard.
2          JOHN BOUCHARD:  I will defer to other committee
3 members at this time.
4          RALPH GERDES:  Thank you.
5          I'm going to go to Microphone 6.
6          TIM ADAMS:  Hello, Mr. Chairman.  I am Tim
7 Adams with the American Society for Healthcare
8 Engineering of the American Hospital Association and
9 stand to -- in opposition to this amendment and support
10 the action of the committee to change the testing
11 frequency of electric pumps -- or the churn test to
12 monthly, we support that.
13          There was data presented I don't think
14 specifically to the comment, perhaps it has been spoken
15 to.  There were four different comments regarding this.
16          The data was submitted and looked at by the committee
17 for 61,070 tests that were performed.
18          This information came from healthcare
19 facilities, from education facilities, and from general
20 services administration showing a 99.96 percent
21 operational state, successful operational state for fire
22 pumps.  That included diesel driven and electric driven.
23          When the committee considered this information
24 in the ROC process, there was a statistical difference
25 noted for electrical pumps as opposed to diesel driven
pumps and consequently the results of that are that the electrical pumps, they have chosen to move to a monthly testing and the diesel driven pumps continue to stay at a weekly testing.

It was noted that an insurance representative said there was 70 fire pump failures because -- and many of those were from contact failures -- contactor failures or electrical problems. The question that I don't know that was answered or data presented regarding those 70 failures were had those particular pumps been tested according -- and inspected according to the NFPA 25 requirements, and I don't know that that had happened.

So it would be interesting to look at those cases or to know were those tests being -- those pumps being routinely tested and still the insurance company found that many failures and data seems -- and not knowing the sample sizing seems a little different than the data that was presented.

It can be argued that there are conditions that can cause a pump to fail such as lightening strikes, and the committee did choose to add into the annex information that in an area where frequent lightening strikes happen, an owner or organization can choose to test those more often. It's -- again, these are minimum
requirements and can always be -- can go even farther.

As an industry, and I'm from the healthcare industry, as an industry that's dedicated to health and healing and providing and the environment, that is exactly what we are after as I know most members in this room are.

I think the data does show, though, that was presented that fire pumps are reliable, and we would like for the members of the NFPA to consider the action that the committee has taken and I support the action they have taken to move churn testing of electric pumps to monthly. Thank you.

RALPH GERDES: Thank you.

Mic 1.

DAVID FULLER: Thank you, Mr. Chairman. My name is David Fuller. I'm from FM Global. I'm an NFPA 20 member as well as an NFPA 25 committee member. I'm speaking in favor of the motion to maintain weekly testing of electric fire pumps.

I'd like to just add in deference to time and respecting everyone's time here tonight, I just wanted to make a few points to follow-up on what Mr. Ray said. Those points being that when you're looking at the differences between electric and diesel drivers relative to testing which we then ignore as the fact
that there's two other parts of the system and that is
the pump itself as well as the controller which both
require weekly testing in order to maintain their
function. And ensure yourself that they're, in fact, in
good working order.

There are certain vulnerabilities associated
with electric fire pump controllers that will go
unnoticed, and they are vulnerable to things like
lightening strike and power surges, and those things are
relays and contactor coils.

Those are not detectable faults within the fire
pump controller, and therefore would be hidden from the
owner/user. The panel itself would show you a green
light when, in fact, that system is not ready to respond
to an automatic start.

Finally, what I would just like to say is that
weekly testing is consistent with other types of NFPA 25
fire protection inspections and tests. For example, an
air compressor on a dry system requires weekly start
testing.

I think it's a little bit inconsistent to look
at this from the perspective of I want to start my air
compressor weekly but not my electric fire pump. It
doesn't seem to make sense to me. Therefore, starting
the pump in addition to the other weekly tests is
It requires minimal additional manpower burden and provides a benefit of providing insurance that the pump system is ready to start in a fully functional condition. Thank you.

RALPH GERDES: Thank you.
I'm going to go to Mic 6.

JIM PETER: Yes. Jim Peter, came with (indiscernible) International speaking on behalf of the healthcare section. This morning at the annual business meeting --

RALPH GERDES: Are you speaking for or against the motion?

JIM PETER: Speaking against the motion. This morning, the healthcare section voted to oppose this motion. The healthcare section of the hospital industry -- healthcare industry is very accustomed to risk assessments. We require to do them for many things.

A risk assessment here has been done using data. Data has shown that weekly testing does not increase reliability. The data shows that. Is it really necessary? Why not -- if weekly's good enough, why isn't daily better? So what's the level of testing
that's accepted?

And I think the data has shown that and we're trying to move forward with codes and say let's justify what we're doing with technical data, and here we've done that and again the argument comes back well, that's not good enough. So I would urge you to reject this comment.

RALPH GERDES: Thank you.

I'm going to go to Mic 5.

RICHARD RAY: Richard Ray, Cybor Fire, speaking in favor of the motion.

The gentleman over here, The data's at 99.6 percent and fire pumps are operational. That's because we've been testing them quickly since 1992. That's why the data is so strong.

My second point, they didn't bring any data that would show that that 99.96 would stay 99.96 if we went to monthly. Annex, no. Where there's lightening prevalent in the area, maybe you want to think about doing this.

I don't know that I want to be the guy that puts my PE stamp on it saying you know what, we don't get a lot of lightening strikes in this area, so we won't worry about having testing on fire pumps weekly. It's not always a lightening strike.
Two years ago, a big manufacturer of controllers, I don't if anybody in this room is from that manufacturer, they had to send out an emergency bulletin, emergency bulletin. When I got my copy, I looked at them and said please read this because it may result in loss of life.

And it had something to do with, and again, I'm not an electrician, I'm sorry, it had something to do with transient voltages and they traced it down to our RF, radiofrequency interference. And they think it was these Nextel phones, I'll say the word. That little chirping thing you can do.

If you were near a fire pump controller that had this certain transducer in it, it would put the fire pump to sleep. The pump would go to sleep, never start, and no one would know it.

The gentleman over here just -- I'm glad -- he's speaking against me, but he nailed it. He said fire pumps are reliable. He's right, because we're testing them weekly. I don't understand, a weekly churn test of a fire pimp takes about 11 minutes. Drop pressure, pump starts, runs for 10 minutes, automatically shuts off.

One more point, starting August 1st, one of the biggest insurance companies that's in this room
requirement is if you buy a fire pump controller that's
going on one of their insured properties, it has to have
a weekly run period time. Weekly. Thank you.

RALPH GERDES: Thank you.

I'm going to go to Microphone 4.

JOHN SADY: John Sady with the U.S. Department
of Energy, a technical committee member since inception
like John at the podium. This topic that's been --

RALPH GERDES: Speaking for or against the
motion?

JOHN SADY: I'm speaking against the motion in
support of the committee action. This topic has been
thoroughly debated and fully discussed and basic
conclusion, the committee action does not change the
churn test of the diesel drivers. It addresses the
electric motors. I urge this membership to support the
committee action and reject the motion on the floor.

Thank you.

RALPH GERDES: Microphone 7.

BILL STALDER: Bill Stalder, Master Control
System, a manufacturer of fire pump controller. I'm
speaking in favor of the motion on the floor. I'd like
to confirm what Ray was saying here, that there is an
industrywide product change to all electric fire pump
controllers to add weekly tests. This is an effective
August 1st of this year. And we always highly recommend qualified personnel be present during any automatic weekly test.

This change now makes weekly test the same for both electric and diesel and all fire pump controllers. I support the motion on the floor.

RALPH GERDES: Thank you.

Microphone 6.

CLAUDE BAKER: Claude Baker, the University of Chicago Hospitals, speaking with the experience I have in 22 years --

RALPH GERDES: Are you speaking for or against the motion?

CLAUDE BAKER: I'm speaking against. Thank you.

In 22 years, I've been involved with three fire pumps that needed to be rebuilt. In each of those cases, we always asked, you know, give us some detail, what contributed to it. And without exception, each of the three different types, three different rebuilders, they said it's your frequent start-ups. If you were to run this continuously, you probably wouldn't be rebuilding it at this time.

I believe that the decay and the hospital pumps that I've experienced were due, in fact, to the frequent
start-ups. And with regard to the 10-minute time out, I don't know where he's running it, but we're running it a little longer than that.

With regard to lightening strikes and power bumps that -- in our controllers, that kicks it on and brings the engineer to the pump. He doesn't leave the pump until he's satisfied the pump is ready to go into service again.

If it's a lightening situation, we go on fire guard and have provisions. If you have other considerations, go to hospitals in other states. I think we're pretty good and we're very comfortable with the monthly testing.

RALPH GERDES: Thank you.

Microphone 7.

DARREL UNDERWOOD: Darrel Underwood, Underwood Fire Equipment. My only comment here --

RALPH GERDES: Speaking for or against the motion?

DARREL UNDERWOOD: For. I had to think for a minute. Yeah, for, and here's the reason why: Not everybody is a hospital. There's housing for the elderly out there, and do you think they have the same kind of maintenance crews that you have in a hospital? I don't think so. And are we trying to protect just the
hospitals or are we trying to protect everyone? That's my only comment.

RALPH GERDES: Thank you.

Microphone 5.

RICH RAY: Rich Ray, Cybor Fore, in favor of the motion. Real quick: Where do I get the ten minutes? NFPA 25 is where it says you run the pump for 10 minutes.

RALPH GERDES: Thank you.

Mic 4.

RUSS LEAVITT: Russ Leavitt, Telgian Corporation, speaking against the motion. Couple of things that we need to be cognizant of. One, there is no such thing as a 10-minute test when it comes to actual time. NFPA 20 and both 25 require a qualified individual to be there at the test. This is the crux. Lots of the -- lots of our buildings don't have qualified individuals to go out and do a pump test.

Our firm deals with about 7000 pumps of which about 6000 of those are motor driven and most of these pumps are run at best semi-annually. They're run when we're there doing some sort of inspection or test. And I can tell you that the failure rate of the electrical motors is virtually nil. When we have a failure, it's at the annual test when the pump does not perform in
delivering the required flow and pressure.

But in terms of operating and running a churn, we just do not see the failures with electrical motors. This is a minimum standard. If factory mutual and insurance company or whoever wants to go to a weekly, have at it, but let's go to monthly, give these owners an opportunity to reasonably test. We don't have much test data in the industry for weekly other than the large users because no one's doing it. Thank you.

RALPH GERDES: Thank you.

Mic 2.

ART BLACK: Mr. Chair, Art Black, Carmel Fire Protection, call the question.

RALPH GERDES: Is there a second?

(Second.)

RALPH GERDES: All those in favor of calling the question, please raise your hands.

(Raising Hands.)

RALPH GERDES: Thank you.

All those opposed?

(Raising Hands.)

RALPH GERDES: That motion passes.

We're going to vote on the motion. There's a group amending motion. The motion is to reject Comment 25-68, -70, -71, and -72. All those in favor, please
1 raise your hands.
2 (Raising Hands.)
3 RALPH GERDES: Okay. Thank you.
4 All those opposed?
5 (Raising Hands.)
6 RALPH GERDES: That motion fails.
7 Moving on to motion sequence 25-14.
8 Mic 5.
9 KEN ISMAN: Thank you. Ken Isman with the National Fire Sprinkler Association, and I move to accept my comment, 25-75.
10 RALPH GERDES: Is there a second?
11 (Second.)
12 RALPH GERDES: Please proceed.
13 KEN ISMAN: Thank you. The way that the committee processed NFPA 25, the document contradicts itself. Section 8.3.5.2.1 specifically says, quote, Theoretical factors for correction to the rated speed shall be applied where determining the compliance of pump per the test, end quote.
14 So you shall apply the correction. It's not even a shall be permitted. It's a shall. You have to apply the corrections, the theoretical corrections, people call them the affinity laws under that section.
15 A few sentences later, Section 8.3.5.7, was
Item 10-8-7
Amy Beasley Cronin  
NFPA, Secretary Standards Council  
1 Battery March Park  
Quincy, MA, 02169

Date: June 23, 2010

Dear Amy:

I hereby want to appeal to Standards Council against the membership vote opposing NITMAM 86-1, which was a motion to revise NFPA 86, Standard for Ovens and Furnaces, by replacing the specific definition used in that standard for the term “flammable limits” by the preferred definition of the same term, from the NFPA Glossary of Terms. The reason that I believe that Standards Council should support this appeal is that the NFPA Advisory Committee on the Glossary of Terminology was set up by Standards Council with the intent of providing uniform definitions throughout the NFPA set of documents. Testimony by the chairman of the technical committee responsible for NFPA 86 during the NFPA Annual Meeting in June indicated that the committee agrees that the two definitions are technically equivalent, but it prefers their own. This is exactly the type of reason that results in needless inconsistency in definitions and goes against the stated intentions by the Standards Council for the Glossary on Terminology. If there is no technical reason for NFPA 86 to have a unique definition for a term (in this case: “flammable limits”) it should adopt the NFPA preferred definition, extracted from NFPA 68, as provided in comment 86-5 and as shown below, and contrasted with the committee’s preferred one.

3.3.17* Flammable Limits. The minimum and maximum concentrations of a combustible material, in a homogeneous mixture with a gaseous oxidizer, that will propagate a flame. [Extract from NFPA 68]  
3.3.17.1 Lower Flammable Limit (LFL). The lowest concentration of a combustible substance in a gaseous oxidizer that will propagate a flame, under defined test conditions. [Extract from NFPA 68]  
3.3.17.2 Upper Flammable Limit (UFL). The highest concentration of a combustible substance in a gaseous oxidizer that will propagate a flame. [Extract from NFPA 68]

**NFPA 86 ROP definition: 3.3.17* Flammable Limits.** The range of concentration of a flammable gas in air within which a flame can be propagated, with the lowest flammable concentration known as the lower flammable limit (LFL), and the highest flammable concentration known as the upper flammable limit (UFL).

Yours sincerely

[Signature]

Marcelo M. Hirschler
86-5 Log #29 Final Action: Reject
(3.3.17 Flammable Limits)

Submitter: Glossary of Terms Technical Advisory Committee / Marcelo Hirschler,
Comment on Proposal No: 86-14
Recommendation: Revise text to read as follows:

3.3.17* Flammable Limits. The range of concentration of a flammable gas in air within which a flame can be propagated, with the lowest flammable concentration known as the lower flammable limit (LFL), and the highest flammable concentration known as the upper flammable limit (UFL). The minimum and maximum concentrations of a combustible material, in a homogeneous mixture with a gaseous oxidizer, that will propagate a flame. [Extract from NFPA 68]

3.3.17.1 Lower Flammable Limit (LFL). The lowest concentration of a combustible substance in a gaseous oxidizer that will propagate a flame, under defined test conditions. [Extract from NFPA 68]

3.3.17.2 Upper Flammable Limit (UFL). The highest concentration of a combustible substance in a gaseous oxidizer that will propagate a flame. [Extract from NFPA 68]

Substantiation: The NFPA Technical Advisory Committee on Terminology was formed by Standards Council to ensure consistency in definitions within the NFPA system. Definitions must be in single sentences. Moreover, definitions cannot contain requirements. There is no problem with adding annex notes that explain the concept further.

There is an existing definition of flammable limits that has the same concepts and would bring consistency. It is contained in NFPA 68, Standard on Explosion Protection by Deflagration Venting, and in NFPA 69, Standard on Explosion Prevention Systems.
Committee Meeting Action: Reject
Committee Statement: As currently defined in NFPA 86, the terms are consistent with their use in the industry. The proposed definitions from NFPA 68, Standard on Explosion Protection by Deflagration Venting, will not add clarity.
Number Eligible to Vote: 26
Ballot Results: Affirmative: 25
Ballot Not Returned: 1 Serafini, Jr., R.
Substantiation: Explosive Range is only used in A.3.3.17 which is annex material for the definition. The terms Flammable Limit, LFL, and UFL are consistent with other related NFPA standards.
This is not original material; its reference/source is as follows:
The proposal content was developed by the NFPA 86 Introductory Chapters Task Group
Committee Meeting Action: Accept in Principle
Accept the proposal with the following revisions.
1. Delete 3.3.17.1 and 3.3.17.2.
2. Revise A.3.3.17 to read:
3. Revise 3.3.36 to read:
3.3.36 Lower Explosive Limit (LEL). See 3.3.17 Flammable Limits
Committee Statement: 1. The definitions are not needed as they are addressed in 3.3.17.
2. The annex text is also extracted from NFPA 68 with revised text.
Number Eligible to Vote: 27
Ballot Results: Affirmative: 24
Ballot Not Returned: 3 George, T., Ostrowski, R., Serafini, Jr., R.
86-14 Log #52  
Final Action: Accept in Principle

(3.3.17 Explosive Range, 3.3.17.1, 3.3.17.2, and 3.3.36)


Recommendation: Revise text as follows:

3.3.17 Flammable Limits. The range of concentration of a flammable gas in air within which a flame can be propagated, with the lowest flammable concentration known as the lower flammable limit (LFL), and the highest flammable concentration known as the upper flammable limit (UFL).

3.3.17.1* Lower Flammable Limit (LFL). The lowest concentration of a flammable gas in air that will propagate a flame, under defined test conditions.

3.3.17.2 Upper Flammable Limit (UFL). The highest concentration of a flammable gas in air that will propagate a flame, under defined test conditions.

3.3.36 Lower Explosive Limit (LEL). See 3.3.17.1 Lower Flammable Limit (LFL).

A.3.3.17.1 Lower Flammable Limit (LFL). LFL is also known as Lower Explosive Limit (LEL).

Search and replace all instances of LEL with LFL in the NFPA 86 Standard.

3.3.12.1 Continuous Vapor Concentration Controller. A device that measures, indicates, and directly or indirectly controls the concentration of a flammable vapor-air mixture as expressed in percentage of the lower explosive flammable limit (LEL).

5.3 Explosion Relief.

5.3.1* Fuel-fired furnaces, and furnaces that contain flammable liquids, gases, or combustible dusts, shall be equipped with unobstructed explosion relief for freely relieving internal explosion pressures except in the following cases:

(1) Explosion relief shall not be required on furnaces with shell construction having 1/16 in. (4.8 mm) or heavier steel plate shells reinforced with structural steel beams and buckstays that support and retain refractory or insulating materials that are required for temperature endurance, which makes them unsuitable for the installation of explosion relief.

(2) Explosion-relief panels shall not be required for low-oxygen atmosphere ovens designed and protected in accordance with Section 10.2.

(3) The requirements for explosion relief shall not apply to thermal oxidizers.

(4) The requirements for explosion relief shall not apply to Class D furnaces.

(5) Explosion-relief panels shall not be required in the work chamber of indirect fired ovens where it is demonstrated by calculation that the combustible concentration in the work chamber cannot exceed 25 percent of the lower explosive flammable limit (LEL) under any conditions.

6.2.7.3* Regulators, relief valves, and switches shall be vented to an approved location, and the following criteria also shall be met:

(1) Heavier-than-air flammable gases shall be vented outside the building to a location where the gas is diluted below its lower flammable limit (LEL) before coming in contact with sources of ignition or re-entering the building.

(2) Vents shall be designed to prevent the entry of water and insects without restricting the flow capacity of the vent.

8.4.1.4 A furnace heating system shall be permitted to be purged into an operating incinerator if it can be demonstrated that the flammable vapor concentration entering the fume incinerator cannot exceed 50 percent of the LFL.

8.4.1.7 Prior to the reignition of a burner after a burner shutdown or flame failure, a preignition purge shall be accomplished.

CAUTION: Repeated ignition attempts can result in a combustible concentration greater than 25 percent of the LFL. Liquid fuels can accumulate, causing additional fire hazards.

8.4.1.8 Repeating the preignition purge shall not be required where any one of the following conditions is satisfied:

(1) The heating chamber temperature is proven above 1400 F (760 C).

(2) For any fuel-fired system, all of the following conditions are satisfied:

(a) Each burner and pilot is supervised by a combustion safeguard in accordance with Section 8.9.

(b) Each burner system is equipped with safety shutoff valves in accordance with Section 8.7.

(c) At least one burner remains operating in the common combustion chamber of the burner to be reignited.

(3) All of the following conditions are satisfied (does not apply to fuel oil systems)

(a) Each burner and pilot is supervised by a combustion safeguard in accordance with Section 8.9.

(b) Each burner system is equipped with safety shutoff valves in accordance with Section 8.7.

(c) It can be demonstrated that the combustible concentration in the heating chamber and all other passages that handle the recirculation and exhaust of products of combustion cannot exceed 25 percent of the LFL.

8.4.2.2 The trial-for-ignition period of the main gas burner shall not exceed 15 seconds, unless both of the following conditions are satisfied:

(1) A written request for an extension of trial for ignition is approved by the authority having jurisdiction.

(2) It is determined that 25 percent of the LFL cannot be exceeded in the extended time.

8.7.1.2 or shall shut off those burner(s) by closing a single safety shutoff valve, where the following conditions are satisfied:

(1) Individual burner safety shutoff valve meets one of the two following conditions:

(a) It is demonstrated, based on available airflow, that failure of the valve to close will result in a fuel concentration not greater than 25 percent of the LFL.

(b) The safety shutoff valve has proof of closure acceptable to the authority having jurisdiction.

(2) The safety shutoff valve upstream of the individual burner safety shutoff valves shall close when any of the following conditions occurs:

(a) Upon activation of any operating control or interlocking safety device other than the combustion safeguard

(b) Where the individual burner valves do not have proof of closure as described in 8.7.1.3(b) and the number of failed burners is capable of exceeding 25 percent of the LFL if single burner safety shutoff valves fail in the open position.
(c) Where individual burner valves have proof of closure as described in 8.7.1.3(1)(b) and verification that the individual burner safety shutoff valve has closed following loss of flame signal at the burner is not present.

(d) Upon loss of flame signal at all burners in the burner system or at a number of burners in the burner system that will result in a fuel concentration greater than 25 percent of the LEL.

(e) When the heating chamber is proved at or above 1400 F (760 C) and both of the following conditions exist:

10.5.1.2* LEL Correction Factor.

(A) The LEL value for continuous process ovens shall be corrected for the oven operating temperature in accordance with the following formula or by using Table 10.1.5.2(A):

\[ \text{LEL}_{\text{o}} = \text{LEL}_{77^\circ F} [1 - 0.000436 (t^\circ F - 77^\circ F)] \] or

\[ \text{LEL}_{\text{o}} = \text{LEL}_{25^\circ C} [1 - 0.000784 (t^\circ C - 25^\circ C)] \]

where:

\( t \) = oven temperature, \( F \) or \( C \)

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<th>Oven Temperature</th>
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10.1.6.1* Rate of Solvent Vapor Ventilation.

(A) The safety ventilation rate of continuous process ovens shall be designed, maintained, and operated to do either of the following:

(1) Prevent the vapor concentration in the oven exhaust from exceeding 25 percent of the LEL.

(2) Operate at a safety ventilation rate lower than that specified in 10.1.6.1(A)(1) where a continuous solvent vapor concentration indicator and controller meeting the criteria of 10.1.6.1(B) is provided in accordance with 10.2.8.

(B) Where a continuous solvent vapor indicator and controller is provided, it shall be arranged to do either of the following:

(1) Alarm and shut down the oven heating systems

(2) Operate additional exhaust fans at a predetermined vapor concentration not exceeding 50 percent of the LEL.

10.1.6.2 Method for Determining Solvent Safety Ventilation Rate.

(A)*In continuous process ovens, the rate of safety ventilation air shall be either calculated using 10.1.6.2(B) or 10.1.6.2(C) or estimated using 10.1.6.2(D). The values determined shall be corrected for the exhaust stream temperature and altitude to determine the actual flow.

(B) Method A shall be calculated as follows:

(1) Determine the cubic feet of vapor per gallon of solvent using the following equation:

\[ \frac{\text{ft}^3 \text{ vapor}}{\text{gal solvent}} = \frac{8.328}{0.075} \left( \frac{\text{SpGr}}{\text{VD}} \right) \]

or

\[ \frac{m^3 \text{ vapor}}{L \text{ solvent}} = \frac{0.998}{1.200} \left( \frac{\text{SpGr}}{\text{VD}} \right) \]

where:

- 1 gal water = 8.328 lb at 70 F, or 1 L water = 0.998 kg at 21 C
- Dry air at 70 F = 0.075 lb/ft\(^3\) and 29.9 in. Hg, or
- Dry air at 21 C = 1200 kg/m\(^3\) and 0.76 m Hg
- SpGr = specific gravity of solvent (water = 1.0)
- VD = vapor density of solvent vapor (air = 1.0)

(2) Determine the cubic feet of barely explosive mixture per gallon of solvent evaporated in the process using the following equation:

\[ \frac{\text{ft}^3 \text{ barely explosive mixture}}{\text{gal solvent evaporated}} = \left( \frac{\text{ft}^3 \text{ mixture}}{\text{gal solvent}} \right) \left( \frac{100 - \text{LEL}_{\text{L}}}{\text{LEL}_{\text{L}}} \right) \]

or

\[ \frac{m^3 \text{ barely explosive vapor}}{L \text{ solvent evaporated}} = \left( \frac{m^3 \text{ mixture}}{L \text{ solvent}} \right) \left( \frac{100 - \text{LEL}_{\text{L}}}{\text{LEL}_{\text{L}}} \right) \]

where:

- LEL, LFL = lower explosive flammable limit expressed in percent by volume in air, corrected for temperature

Table 10.1.5.2(A)  Oven Temperature Correction Factors

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10.1.7.3 Method for Calculating Ventilation Rate. The minimum safety ventilation rate shall be one of the following:

(1) 440 scfm of air per gal (3.29 standard m³/min of air per L) of solvent

(2) Other than 440 scfm where ventilation is provided, with exhaust fans and other devices to prevent average concentration in the oven from exceeding 25 percent of the LFL

(3) A continuous vapor concentration high limit controller meeting one of the following criteria is provided:

(a) The controller is arranged to alarm and shut down the oven heating system.

(b) The controller is arranged to operate additional exhaust fans at a predetermined vapor concentration not exceeding 50 percent of the LFL. The amount of ventilation air in standard cubic feet (standard cubic meters) that is rendered barely flammable by the vapor generated in gallons per hour (liters per hour) of solvent in use is determined, and the determined value then is multiplied by an empirical factor of 10 and divided by 60 minutes/hour to obtain the safety ventilation in standard cubic feet per minute (standard cubic meters per minute).

10.1.8.1 Where the safety ventilation rate in the oven has been designed to provide vapor concentrations between 25 percent and 50 percent of the LFL, a continuous vapor concentration high limit controller shall be provided.

10.1.8.2* The continuous vapor concentration high limit controller shall be capable of detecting and responding to process upset conditions to initiate reduction of the vapor concentration before the concentration exceeds 50 percent of the LFL.

10.1.8.3* Where an oven having multiple heating zones and at least one heating zone operating at or above 25 percent of the LFL, all other heating zones shall be equipped with either of the following:

(1) A continuous vapor concentration high limit controller

(2) Without a continuous vapor concentration high limit controller where it can be demonstrated that a heating zone cannot exceed 25 percent of the LFL in the case of an accidental increase in solvent input

10.1.8.4* Where a continuous vapor concentration controller is used to modulate the flow of fresh air or exhaust from an oven or zone, the following criteria shall apply:

(1) A secondary protection system shall be required to prevent an analyzer failure from causing a hazardous condition.

(2) The secondary protection system shall have a separate continuous vapor concentration high limit controller for each zone.

(3) Limits on damper travel (set for 50 percent LFL for the highest design solvent input) for each zone shall be permitted in lieu of the requirement of 10.1.8.3(2).

10.2.5.6 The stored volume shall be permitted to be reduced, provided that both of the following conditions are met:

(1) Mixing is adequate.

(2) The stored volume is sufficient to reduce the concentration in the oven to the LFL in air.

12.1.5.1 General.
(5) Purging of the furnace atmosphere shall begin and shall continue until the purge is completed per the timed flow method of Section 12.7 or until two consecutive analyses of all chambers indicate that the atmosphere is less than 50 percent of its LFL.

12.4.2.5.1 Purge with an Inert Gas.

(A) In addition to the requirements of 12.4.2.5.1, the furnace manufacturer’s instructions shall be referenced for further mechanical operations, and the following also shall apply:

(1) The supplier of the special atmosphere shall be consulted for process and safety instructions.

(2) Where required, the procedures of 12.4.2.5.1 shall be modified where improvements in the operation or safety of the furnace are required.

(3) Modifications to 12.4.2.5.1 shall be approved.

(B) The following purge procedure shall be performed in the given sequence:

(1) The furnace shall not be automatically cycled during the purging procedure.

(2) The purge gas supply shall be provided in accordance with 12.1.5.1(D).

(3) The inert gas purge system shall be actuated to purge the furnace at a rate that maintains a positive pressure in all chambers.

(4) All valves such as special atmosphere gas valves, process gas valves, and flame curtain valves shall be closed immediately.

(5) Purging of the furnace atmosphere shall begin. The inert gas purge shall continue until the purge is completed per the timed flow method of Section 12.7 or until two consecutive analyses of all chambers indicate that the atmosphere is less than 50 percent of its LFL.

12.4.2.7.1 Purge with an Inert Gas.

(A) In addition to the requirements of 12.4.2.7.1, the furnace manufacturer’s instructions shall be referenced for further mechanical operations, and the following also shall apply:

(1) The supplier of the special atmosphere shall be consulted for process and safety instructions.

(2) Where required, the procedures of 12.4.2.7.1 shall be modified where improvements in the operation or safety of the furnace are required.

(3) Modifications to 12.4.2.7.1 shall be approved.

(B) The following purge procedure shall be performed in the given sequence:

(1) The furnace shall not be automatically cycled during the purging procedure.

(2) The purge gas supply shall be provided in accordance with 12.1.5.1(D).

(3) All doors shall be closed.

(4) The inert gas purge system shall be actuated to purge the furnace at a rate that maintains a positive pressure in all chambers.

(5) All valves such as special atmosphere gas valves, process gas valves, and flame curtain valves shall be closed.

(6) Purging of the furnace atmosphere shall begin and shall continue until the purge is completed per the timed flow method of Section 12.7 or until two consecutive analyses of all chambers indicate that the atmosphere is less than 50 percent of its LFL.

12.5.2.4 Removal of Special Atmosphere Gas from Type VII Furnace by Purge Procedure with an Inert Gas.

(A) In addition to the requirements of 12.5.2.4, the furnace manufacturer’s instructions shall be referenced for further mechanical operations, and the following also shall apply:

(1) The supplier of the special atmosphere shall be consulted for process and safety instructions.

(2) Where required, the procedures of 12.5.2.4 shall be modified where improvements in the operation or safety of the furnace are required.

(3) Modifications to 12.5.2.4 shall be approved.

(B) The following purge procedure shall be performed in the given sequence:

(1) The furnace shall not be automatically cycled during the purging procedure.

(2) The purge gas supply shall be provided in accordance with 12.1.5.1(D).

(3) All doors (if provided) shall be closed.

(4) The inert gas purge shall be initiated, and a flow that maintains a positive pressure in the furnace by itself shall be ensured.

(5) All valves such as special atmosphere gas valves, process gas valves, and flame curtain valves (if provided) shall be closed.

(6) Purging of the furnace atmosphere shall begin and shall continue until the purge is completed per the timed flow method of Section 12.7 or until two consecutive analyses of all chambers indicate that the atmosphere is less than 50 percent of its LFL.

12.6.2.4 Removal of Flammable Special Atmosphere Gas from Type VIII Heating Cover Furnace by Purge Procedure.

(A) Combustible gases within the inner cover (retort) shall be purged before the inner cover is removed.

(B) In addition to the requirements of 12.6.2.4, the furnace manufacturer’s instructions shall be referenced for further mechanical operations, and the following also shall apply:

(1) The supplier of the special atmosphere shall be consulted for process and safety instructions.

(2) The manufacturer or user shall be permitted to modify the procedures of 12.6.2.4 if required to improve operational and emergency safety.

(3) Where required, the procedures of 12.6.2.4 shall be modified where improvements in the operation or safety of the furnace are required.

(4) Modifications to 12.6.2.4 shall be approved.

(C) The following purge procedure shall be performed in the given sequence:

(1) The purge gas supply shall be provided in accordance with 12.1.5.1(D).

(2) The outer heating cover shall be removed from over the inner cover.

(3) The flammable special atmosphere gas safety shutoff valve shall be closed, causing the inert gas to flow into the inner cover (see 12.6.6.2), and the following criteria shall be met:

(a) The inert gas flow shall maintain the manufacturer’s required minimum pressure, as indicated by the bubbler, vent manometer, or similar device.

(b) The inert gas purge shall continue until the purge is completed per the timed flow method of Section 12.7 or until two consecutive analyses inside the inner cover indicate that the atmosphere is less than 50 percent of its LFL.

12.6.2.6 Removal of Flammable Special Atmosphere Gas from Type IX Heating Cover Furnace by Purge Procedure.
12.3.3.1 Purging.

(1) Where required, the procedures of 12.6.2.6(B) shall be modified where improvements in the operation or safety of the furnace are required.

(2) Modifications to 12.6.2.6(B) shall be approved by the authority having jurisdiction.

(C) The following purge procedure shall be performed in the given sequence:

(1) The purge gas supply shall be provided in accordance with 12.1.5.1(D), and the following criteria shall be met:

(a) The inert gas flow shall maintain the manufacturer’s required minimum pressure, as indicated by the bubbler, vent manometer, or similar device.

(b) The inert gas purge shall continue until the purge is completed per the timed flow method of Section 12.7 or until two consecutive analyses inside the work chamber indicate that the atmosphere is less than 50 percent of its LFL.

(2) Venting of the vacuum pump shall be in accordance with Paragraph 6.2.7.3.

(3) The vent piping should not have any shutoff valves in the line.

(4) The vent pipe should be sized to minimize the pressure drop associated with length, fitting, and elbows at the maximum vent flow rate.

(5) Gas should not impinge on equipment, support, building, windows, or other devices that utilize ambient air.

(3) Gas should not be vented in the vicinity of air intakes, compressor inlets, or other devices that utilize ambient air.

The vent exit should be designed in accordance with the following:

(1) The pipe exit should not be subject to physical damage or foreign matter that could block the exit.

(2) The vent pipe should be sized to minimize the pressure drop associated with length, fitting, and elbows at the maximum vent flow rate.

(3) Gas should not be vented in the vicinity of air intakes, compressor inlets, or other devices that utilize ambient air.

The vent exit should be designed in accordance with the following:

(1) If the gas is flammable and lighter than air, the flammable gases should be vented to a location where the gas is diluted below its lower flammable limit (LFL) before coming in contact with sources of ignition and the gas cannot re-enter the work area without extreme dilution.

(2) If the gas is oxygen or air enriched with oxygen, the vent gas should be vented to a location where the gas will blend with atmospheric air to a point between 19 percent and 23 percent oxygen before coming in contact with combustibles or personnel.

A.9.5.3 Concentrations at 25 percent LFL can produce a temperature rise near 600 F (316 C) that, where added to the required inlet temperature, results in temperatures generally considered to be within a range where thermal degradation occurs.

In the event of a high-temperature shutdown of the system, the catalyst bed will need to be cooled to prevent further damage of the catalyst through thermal or high-temperature breakdown. Most catalysts employ a high surface area substrate, such as alumina, that allows for the maximum amount of catalyst material exposed to the furnaces per unit of catalyst (pellet, granule, or structured packing). The surface area of the catalyst can be diminished through failure of the pore structure of the substrate at elevated temperatures (typically greater than 1200 F (649 C)), which results in less exposed catalyst material per unit of catalyst and a lower activity. This rate of thermal poisoning is a function of temperature and duration, and the net effect can be minimized by quickly cooling the catalyst to safe operating temperatures, from 450 F to 950 F (232 C to 510 C).

A.10.1.5.2 Most LFL values are reported at 77 F (25 C), although several are given at 212 F (100 C). The LFL value decreases at higher temperatures, so it is necessary that the LFL value for the particular solvent be corrected for the operating temperature of the oven.

The formula used in 10.1.5.2 was originally published in Bureau of Mines Bulletin 627, “Flammability of Combustible Gases and Vapors.” The temperature correction factor also can be expressed approximately as a 5 percent reduction in the LFL value for each 100 F (37.8 C) rise in temperature above 77 F (25 C).

A.10.1.6.2(A) Chemical properties can be obtained from manufacturers or from published data. The data in Table A.10.1.6.2(A)(a) and Table 10.1.6.2(A)(b) have been obtained from NFPA 325, Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, and material safety data sheets (MSDS) where available. Available figures from numerous sources vary over a wide range in many instances, depending on the purity or grade of samples and on the test conditions prescribed by different observers.

(Note: Although NFPA 325 has been officially withdrawn from the National Fire Codes, the information is still available in NFPA’s Fire Protection Guide to Hazardous Materials.)

The importance of obtaining precise data on the rate of evaporation by actual tests on particular paint formulations in use needs to be emphasized. Some of these multiple component preparations might contain several solvents with widely differing values of LFL, specific gravity, and vapor density. Until such determinations are made, the operation should be on the side of safety. Therefore, the individual solvent whose data result in the largest required volume of air per gallon should be used as the basis for safe ventilation.
Table A.10.1.6.2(A)(a) Properties of Commonly Used Flammable Liquids in U.S. Customary Units

(Change LEL to LFL in table)

Table A.10.1.6.2(A)(b) Properties of Commonly Used Flammable Liquids in Metric Units

(Change LEL to LFL in table)

Theoretical Determination of Required Ventilation. Problem  For continuous oven: The volume of oven dilution air that would render vapor from a known volume of toluene barely flammable is determined as follows:

1. 1 gal of water weighs 8.328 lb at 70 F; 1 L of water weighs 0.998 kg at 21 C
2. Dry air at 70 F and 29.9 in. Hg weighs 0.075 lb/ft³; dry air at 21 C and 0.76 m Hg weighs 1.200 kg/m³
3. 1 m³ = 1000 L = 1000 dm³
4. Specific gravity (SpGr) of toluene = 0.87 (water = 1.0)
5. Vapor density (VD) of toluene = 3.1 (air = 1.0)
6. Lower explosive flammable limit (LEL) = 1.1 percent by volume (See Table 10.1.6.2(A)(a) and Table 10.1.6.2(A)(b)) and in the LFL, LFL calculations is expressed as 1.1 (not 0.011); this value for the LFL is at standard ambient temperature of 70 F (21 C)
7. Measured oven exhaust temperature (t) = 300 F (149 C)
8. Corrected LEL, LFL, (LFL, LFL,) for oven exhaust temperature is as follows:

\[
\left( \frac{100 - 0.99}{0.99} \right) = 23.30 \text{ m}^3/\text{L at 21°C}
\]

For this example:

\[
0.998 \frac{\text{LFL}}{1.200} \left( \frac{\text{SpGr}}{\text{VD}} \right) = \text{m}^3/\text{L at 21°C}
\]

Products of combustion must be added to this volume in accordance with 10.1.6.3 and then corrections made for higher oven exhaust temperature and, if applicable, for elevations of 1000 ft (305 m) or greater. An example of how these additional factors are applied can be found in A.10.1.6.4.

SI Units. To determine the cubic meters (m³) of vapor per liter (L) of solvent, the following calculation is used:

\[
\left( \frac{100 - 0.99}{0.99} \right) = 31.16 \text{ ft}^3/\text{gal at 70°F}
\]

For this example:

\[
0.88 \left( \frac{8.328 \text{ lb H}_2\text{O}}{\text{gal}} \right) = 7.33 \text{ lb xylene/gal}
\]

Volume of 1 gal xylene, when vaporized, is as follows:

\[
\frac{(7.33 \text{ lb})(387 \text{ ft}^3)}{106 \text{ (molecular weight)}}
\]

For continuous oven: The volume of oven dilution air that would render vapor from a known volume of toluene barely flammable is determined as follows:

1. 1 gal of water weighs 8.328 lb at 70 F; 1 L of water weighs 0.998 kg at 21 C
2. Dry air at 70 F and 29.9 in. Hg weighs 0.075 lb/ft³; dry air at 21 C and 0.76 m Hg weighs 1.200 kg/m³
3. 1 m³ = 1000 L = 1000 dm³
4. Specific gravity (SpGr) of toluene = 0.87 (water = 1.0)
5. Vapor density (VD) of toluene = 3.1 (air = 1.0)
6. Lower explosive flammable limit (LEL) = 1.1 percent by volume (See Table 10.1.6.2(A)(a) and Table 10.1.6.2(A)(b)) and in the LFL, LFL calculations is expressed as 1.1 (not 0.011); this value for the LFL is at standard ambient temperature of 70 F (21 C)
7. Measured oven exhaust temperature (t) = 300 F (149 C)
8. Corrected LEL, LFL, (LFL, LFL,) for oven exhaust temperature is as follows:

\[
\left( \frac{100 - 0.99}{0.99} \right) = 23.30 \text{ m}^3/\text{L at 21°C}
\]

For this example:

\[
0.998 \frac{\text{LFL}}{1.200} \left( \frac{\text{SpGr}}{\text{VD}} \right) = \text{m}^3/\text{L at 21°C}
\]

Products of combustion must be added to this volume in accordance with 10.1.6.3 and then corrections made for higher oven exhaust temperature and, if applicable, for elevations of 1000 ft (305 m) or greater. An example of how these additional factors are applied can be found in A.10.1.6.4.

Another Method of Computation. For this example, xylene is to be used as the solvent, as follows:

1. Specific gravity (SpGr) of xylene = 0.88 (water = 1.0).
2. Molecular weight of C₆H₅CH₃ = 106.
3. Lower explosive flammable limit (LEL, LFL) of xylene in air = 0.9 percent by volume (See Table A.10.1.6.2(A)(a) and Table A.10.1.6.2(A)(b)).
4. Corrected LEL, LFL, (LFL, LFL,) for oven exhaust temperature is as follows:

\[
\left( \frac{100 - 0.99}{0.99} \right) = 31.16 \text{ ft}^3/\text{gal at 70°F}
\]

For this example:

\[
0.88 \left( \frac{8.328 \text{ lb H}_2\text{O}}{\text{gal}} \right) = 7.33 \text{ lb xylene/gal}
\]

Volume of 1 gal xylene, when vaporized, is as follows:

\[
\frac{(7.33 \text{ lb})(387 \text{ ft}^3)}{106 \text{ (molecular weight)}}
\]
The Lower Flammable Limit (LFL), being equivalent to 0.81 percent of the cubic feet of air rendered explosive by 1 gal xylene, is as follows:

\[
26.76 \left( \frac{100 - 0.81}{0.81} \right) = 3277 \text{ ft}^3 \text{ air at 70°F per gal xylene}
\]

Products of combustion must be added to this volume in accordance with 10.1.6.3 and then corrections made for higher oven exhaust temperature and, if applicable, for elevations of 1000 ft (305 m) or greater. An example of how these additional factors are applied can be found in A.10.1.6.4.

**SI Units.** Weight of 1 L xylene, when vaporized, is as follows:

\[
\frac{0.998 \text{ kg H}_2\text{O}}{\text{L}} \left( \frac{1000 \text{ g}}{\text{kg}} \right) \left( 0.88 \text{ SpGr} \right) = 878 \text{ g xylene/L}
\]

Volume of 1 L xylene, when vaporized, is as follows:

\[
\frac{(878 \text{ g})(24.1 \text{ L})}{106 \text{ (molecular weight)}} = 200 \text{ L xylene vapor at standard conditions}
\]

The Lower Flammable Limit (LFL), being equivalent to 0.81 percent of the cubic meters of air rendered explosive by 1 L xylene, is as follows:

\[
200 \text{ L} \left( \frac{100 - 0.81}{0.81} \right) \left( \frac{1 \text{ m}^3}{1000 \text{ L}} \right) = 24.49 \text{ m}^3 \text{ air at 21°C per L xylene}
\]

Products of combustion must be added to this volume in accordance with 10.1.6.3 and then corrections made for higher exhaust temperature and, if applicable, for elevations of 1000 ft (305 m) or greater. An example of how these additional factors are applied can be found in A.10.1.6.4.

The submitter stopped his search of the NFPA 86 document here. There are more uses of Lower Explosive Limit (LEL) that needs to change to Lower Flammable Limit (LFL).

**In a similar way search and replace all instances of Upper Explosive Limit (UEL) with Upper Flammable Limit (UFL) in the NFPA 86 Standard.**

**Substantiation:** Explosive Range is only used in A.3.3.17 which is annex material for the definition. The terms Flammable Limit, LFL, and UFL are consistent with other related NFPA standards.

**Committee Meeting Action:** Accept in Principle

Accept the proposal with the following revisions.

1. Delete 3.3.17.1 and 3.3.17.2.
2. Revise A.3.3.17 to read:
3. Revise 3.3.36 to read:
   3.3.36 Lower Explosive Limit (LEL). See 3.3.17 Flammable Limits

**Committee Statement:** 1. The definitions are not needed as they are addressed in 3.3.17.
2. The annex text is also extracted from NFPA 68 with revised text.

**Number Eligible to Vote:** 27

**Ballot Results:** Affirmative: 24

**Ballot Not Returned:** 3 George, T., Ostrowski, R., Serafini, Jr., R.
Mr. Gallagher.

RICHARD GALLAGHER: Mr. Chair, ladies and gentlemen, the report of the technical committee on ovens and furnaces is presented for adoption. It can be found in the report of proposals or report on comments from the 2010 annual meeting (indiscernible) individual cycle.

The technical committee has published a report consisting of a partial revision of NFPA 86, standard (indiscernible) ovens and furnaces.

The presiding officer will now proceed with the certified amending motions.

SHANE CLARY: Thank you.

Let's now proceed with discussions of the certified amending motions for NFPA 86, and Microphone No. 5.

MARCELO HIRSCHLER: Marcelo Hirschler, GBH International, speaking on behalf of the NFPA glossary of terms taking advisory committee. I move to accept Comment 86-5.

SHANE CLARY: Thank you.

Do we have a second?

(Second.)
SHANE CLARY: Thank you.

Please proceed.

Marcelo Hirschler: The NFPA standards council set up the technical advisory committee so that we can get general consensus on definitions and uniformity of definitions throughout the NFPA system.

It's not our job to discuss technical issues that are specific to particular committees just to try to get consensus and uniformity of definitions. The definition that I'm talking about here is the definition of flammable limits.

The -- if you look at page 86-2 in the ROC for A2010, you will see that there is the definition of flammable limits that the committee accepted is the range of concentration of flammable gas and air within which a flame can be propagated between the lower and the upper flammable limited basically. I'm cutting it short.

What I'm moving is that we take the definition from NFPA 68 which is the preferred definition within the NFPA glossary of terms which does exactly the same thing. It's slightly different language.

The (indiscernible) maximum concentration combustible material and how much mixture...
1 (indiscernible) oxide (indiscernible) the flame and then
2 there's some definitions of lower and upper flammable
3 limits. I won't bother -- bore you with reading them,
4 but they're identically taken from NFPA 68. They're
5 extracted.
6
7 That is the preferred NFPA definition. There's
8 no technical difference between that definition and the
9 definition that the committee accepted, but what we're
10 trying to do is get uniformity within the NFPA system.
11 I urge you to support the motion and change the
12 definition. Thank you.
13
14 SHANE CLARY: Thank you.
15
16 Mr. Gallagher, comments?
17
18 RICHARD GALLAGHER: Yes. The technical
19 committee on oven and furnaces considered this matter
20 during the ROP, during the ROC, and following the
21 certification of the motion.
22
23 The committee is aware of the efforts to manage
24 the NFPA glossary of terms, however the efforts should
25 be supported to our primary objective delivering NFPA
26 standards that are focused upon fire safety. While
27 definitions of LFL and UFL used in NFPA 68 are more
28 general and more inclusive, for ovens and furnaces, a
29 combustible substance is a flammable gas and a gaseous
30 oxidizer is air.
Rather than obscure the purpose of these definitions, it is the position of the committee that we want the definitions to use familiar terminology that will not be subject to misunderstanding. And it is the position of the committee that this approach will benefit those using the standard and those using the standard include the personnel who are responsible for the day-to-day operation of ovens and furnaces.

In preparation for responding to this motion, I received feedback from over 85 percent of the committee members and here's what they told me. Over 85 -- I should say over 80 percent were firmly opposed to the motion. The remainder had no specific opinion and supported the overall decision of the committee.

Mr. Chair, ladies and gentlemen, the technical committee on oven and furnaces recommends rejecting this motion.

SHANE CLARY: Thank you. At this we'll now proceed for discussion on the motion, and we'll begin at Microphone No. 9.

DAVID YATES: Thank you, Mr. Chairman. David Yates with Liberty Mutual Property speaking in favor of the motion on the floor.

When the glossary of terms project began, there were approximately 2700 redundant definitions throughout
the national fire codes. That means specifically that there were 2700 cases where terminology was not consistent throughout the NFPA. I believe that number is down to approximately 1500 as we speak, so there has been some progress.

What we're talking about here specifically with this motion is we're describing the physical property of a substance. There should only be one definition for that. It doesn't change. It should be consistent, and I urge the membership to vote in favor of this motion so we can have consistent terminology throughout the national fire codes. Thank you.

SHANE CLARY: Thank you.

And Microphone No. 4, please.

TOM GEORGE: Thank you, Mr. Chair. My name is Tom George with Tokio Marine Management. I'm a member of the 86 committee, and I'm speaking in opposition to the motion.

I essentially would want to summarize or reiterate as Rich indicated, and particularly in terms of Class A ovens. We find that "lower flammable limit" and "upper flammable limit" are terms that pertain directly to mixtures of flammable gas and air. In fact, much of the chapters in relation to Class A ovens is focused in determining safety ventilation which is in
1. turn determining the amount of air moving through an oven.

   So I believe that it is more understandable to end users especially operators and maintenance personnel to use the definition that the committee has included in the current text. Thank you.

   SHANE CLARY: Thank you. And we'll return to Microphone No. 5.

   MARCELO HIRSCHLER: Marcelo Hirschler, GBH International for the glossary of terms committee. I urge you all, please, read --

   SHANE CLARY: Are you speaking in favor of the motion?

   MARCELO HIRSCHLER: In favor of the motion.

   SHANE CLARY: You may now proceed.

   MARCELO HIRSCHLER: I urge you to read the two definitions. Technically there is no difference between the two definitions. The definition of the committee talks about a range of concentration between the lowest and -- the lowest flammable concentration, the lowest flammable limit and the highest flammable concentration, the upper flammable limit. The definition that is in the glossary is the maximum/minimum concentration that will propagate a flame and has a definition of lower flammable, upper flammable limit.
What we're talking about is to try to get a consistency. Decrease the number of unnecessary slightly different definitions which don't lead anywhere, that the meaning of the two definitions identical. The only change is that we need to get the number of definitions that NFPA has down to a manageable level and for that we need to get rid of those that are not a -- significantly different.

If there's something specific to the committee and a lot of committees, have definitions that need something specific that can be done by adding an annex note, by explaining within the standard, by doing things of that nature. This is just defining terms.

Flammable limits are things that we've known since high school. There is nothing specific about flammable limits for -- that's different or flammable limits for other things. Flammable limits are flammable limits. Please support the motion.

SHANE CLARY: Thank you.

Microphone No. 4, please.

RUSSELL LEVITT: Good afternoon. My name is Russell Leavitt, Telgian Corporation. I'm speaking against the motion. I concur in general, but I believe that the -- although I agree with the intent to try and limit the definitions, I firmly believe that the
definitions should be left to the purview, the final
decision of the technical committee, and the overall
definitions should support the data, support the chair
of the technical committee's position on that.

SHANE CLARY: Thank you.

And Mr. Gallagher, do you have any concluding
comments?

RICHARD GALLAGHER: Just to recognize the
comment by the speaker that these are the same
definitions, I don't know we have any disagreement
there. The only issue is we want something that is
going to be easily understood, not misunderstood, and
hopefully help promote additional safety for the users
of this document. That's our sole objective and I think
that's the objective of this organization.

SHANE CLARY: Okay. Thank you.

At this time we will proceed to the vote and,
again, it's on the motion which is to accept Comment
86-5. All in favor of the motion, please signify by
raising your hands.

(Raising Hands.)

SHANE CLARY: Thank you.

All opposed?

(Raising Hands.)

SHANE CLARY: I'm sorry, but we're going to go
to the standing count. So all in favor, let's exercise those knees, please stand up.

(Standing.)

SHANE CLARY: Okay. You may please be seated. All opposed, your turn.

(Standing.)

SHANE CLARY: And, again, if you've got your badges on, make sure that the yellow item is showing outward.

Okay. The motion fails. The vote was 41 in favor, 53 against, and numerous exceptions.

Thank you, Mr. Gallagher.

The next report under consideration this afternoon is that of the technical committee on vending systems for cooking appliances.

Here to present the committee's report is committee chair RT Light (phonetic) from the state of Delaware, Wilmington, Delaware. The committee report can be found in the blue 2010 annual revision cycle ROP and ROC. The certified amending motions are contained in the motions committee report behind me on the screen, and we will proceed in order of the motion numbers presented.

And Mr. Light.

RT LIGHT: Mr. Chair, ladies and gentlemen.
Mary:

As the Chair of the Technical Committee on Ovens and Furnaces, I would like to submit the following comment in regards to the appeal by Marcello Hirschler, GBH International, requesting the council to overturn the floor action on CAM 86-1.

The Technical Committee on Ovens and Furnaces considered this matter during the ROP, during the ROC, and following the certification of the NITMAM.

The Committee is aware of efforts to manage the NFPA Glossary of Terms; however, that effort should be subordinate to our primary objective of delivering NFPA standards that are focused upon fire safety.

While the definitions of LFL and UFL used in NFPA 68 are more general and more inclusive, for ovens and furnaces the "combustible substance" is a "flammable gas" and the "gaseous oxidizer" is "air".

Rather than obscure the purpose of these definitions it is the position of the Committee that we want the definitions to use familiar terminology that will not be subject to misunderstanding. It is also the position of the Committee that this approach will benefit those using the standard, and those using the standard include the personnel that are responsible for the day-to-day operation of ovens and furnaces.

In preparation for responding to this motion at the Technical Meeting in Las Vegas, I received feedback from over 85% of the committee members. Over 80% were firmly opposed to the motion. The remainder had no specific opinion but did support the overall direction of the Committee.

As this appeal by Mr. Hirschler is considered, please know that the Technical Committee on Ovens and Furnaces recommends rejecting this appeal and rejecting the original NITMAM.

Best regards,
Rich

Richard A. Gallagher
Line of Business Director - Property
Zurich Services Corporation

302.737.9277 Office
302.737.9277 Fax
302.420.9138 Cell
richard.gallagher@zurichna.com

*Flexible approach with a broad range of services and products tailored to a customer's needs and culture
*1000 specialists in risk with in-depth technical knowledge and industry segment expertise
*Easy access to relevant risk information, risk management tools and training
*Powerful global service network with representation in 32 countries
Hello Mary,

Please forward my following comments to the council for consideration concerning the appeal on CAM 86-1 regarding comment 86-5.

I am a committee member who was present during the initial discussions and subsequent follow-up discussions. We are well informed and understand the need and policy for consistent and uniform definitions throughout the NFPA set of documents. We have accepted and approved several proposals to adhere to this policy. I state this because Mr. Hirschler’s letter for appeal has misrepresented our reasoning as being merely preference and leads to needless inconsistency. Our committee members seriously evaluate the possible consequences of all requests on changing the definitions. In this particular case, we felt there were too many chances for users of the document to misinterpret the requirements because of the terms used in the preferred definition.

In particular, the terms combustible material, combustible substance, homogeneous mixture, and gaseous oxidizer would tend to mislead users in the oven and furnace industry. For example, material and substance connotes a solid to most of our readers. They might conclude that a LFL reference applies only to solid fuels or processed material that produces dusts. Also, “homogeneous mixture in a gaseous oxidizer” would NOT be understood by most and others would think it is a reference to our term oxidizers, defined as specific types of combustion equipment systems.

Our technical reason for our preferred definition is to avoid user confusion, to provide user-friendly guidance, and most importantly, to remove a chance for ignoring a requirement because of misinterpretation of a definition.

Sincerely,
Dan Curry
Eclipse, Inc.
Maynard, Mary

Subject: FW: Appeal to NFPA re CAM 86-1 (Comment 86-5)

To: NFPA Standards Council
From: Richard J. Martin, Martin Thermal Engineering
Re: Appeal of CAM 86-1 (Comment 86-5)

Please consider the evidence and reasoning below as sufficient grounds to reject the appeal of CAM 86-1 by Mr. Hirschler on the definition of “Flammable Limits”.

1. Contrary to Mr. Hirschler’s letter, although the two definitions may be “technically equivalent” in a very broad sense, the “preferred” NFPA definition (extracted from NFPA 68) is excessively broad and potentially confusing, and therefore there are very good “technical reasons” for NFPA to reject the notion of imposing the currently preferred definition on the NFPA 86 document.
   a. From a technical perspective, the term “flammable limits” should only be applied to gases – (a) fuel gases or fuel vapors plus (b) air or oxygen-enriched-air.
   b. An attempt to include droplets/mists and dusts/particulate in the definition is misguided, as there is no reliable means of determining an “upper flammable limit” for these combustible substances.
   c. NFPA 68 provides a definition for “Minimum Explosible Concentration (MEC)” of mists and dusts (and claims it to be equivalent to the term “Lower Flammable Limit (LFL)”), but does not provide one for “Maximum Explosible Concentration” nor does it claim any limit involving dusts and mists to be equivalent to the term “Upper Flammable Limit (UFL)”.
   d. The value of MEC of dusts and mists is dependent on the particle size distribution. There is no such dependence for gases, since both fuel and air are molecules, not agglomerates.
   e. The terms LFL and MEC should be separate and distinct. The term MEC should be applied exclusively to dusts and mists, while the terms LFL and UFL should be applied exclusively to gases.
   f. From a practical perspective, although “gaseous oxidizer” is a term that is broader than the term “air” and could thereby include air as a sub-category, there are virtually no industrial or commercial applications of “gaseous oxidizers” other than air or oxygen-enriched-air.
   g. The other gaseous oxidizers that might be chemically similar to air or oxygen in their ability to sustain a deflagration (and thereby exhibit “flammable limits” are chlorine and fluorine. Neither ovens nor deflagration vents are particularly useful in atmospheres of chlorine or fluorine.

2. The NFPA Standards Council should ask the NFPA Advisory Committee on the Glossary of Terminology to review their decision to identify the NFPA 68 definition as the “preferred” one for all of NFPA.
   a. Based on the reasoning above, the NFPA 68 definition is excessively broad and potentially confusing, and therefore, the “Glossary of Terminology” advisory committee should be modified to exclude the NFPA 68 definition for “flammable limits” from its list of “preferred” definitions.

Sincerely,

Rick Martin
Secretary of NFPA 86, Technical Committee on Ovens and Furnaces.
My recollection is the committee looked at the NFPA 68 definition for flammable limits in both the ROP and ROC meetings and decided that it was too generic for most users of the NFPA 86 standard. While technically correct, I concur with the committee statement in rejecting the comment in the ROC that the NFPA 68 definition does not add clarity to the terms as used in (most of) the ovens and furnaces industry.

Oxygen enriched air is one very narrow niche in the spectrum of ovens and furnaces that are covered by NFPA 86 and I'm not particularly in favor of providing a more “obtuse” definition to accommodate that niche. The designers and users of that specialized equipment know what they are doing and don't need to depend on a definition of flammable limits in NFPA 86 to define their operating parameters.

The less sophisticated users of the standard are the ones I am much more concerned about and substituting “oxidizer” for “air” is not helpful for them.

Also, the way I read the ROP, the committee rejected adding 3.3.17.1 and 3.3.17.2 as proposed in the submittal by Ted Jablkowski, stating they were already defined within 3.3.17.

The attached is a summary I put together for the FM Global engineer who will be attending the annual meeting that shows the ROP and ROC actions and in which I state my support for the committee actions in both the ROP and ROC stages and my support for rejecting the NITMAM.

Maybe we need to discuss further ???

Best regards,

Mike
I. Committee Action of Proposal 86-14 (as it pertains to 3.3.17)

3.3.17* Explosive Range Flammable Limits. The range of concentration of a flammable gas in air within which a flame can be propagated, with the lowest flammable concentration known as the lower explosive flammable limit (LEFL), and the highest flammable concentration known as the upper explosive flammable limit (UEFL).


II. Committee Action on Comment 86-5

86-5 Log #29 Final Action: Reject

(3.3.17 Flammable Limits)

Submitter: Glossary of Terms Technical Advisory Committee / Marcelo Hirschler,

Comment on Proposal No: 86-14

Recommendation: Revise text to read as follows:

3.3.17* Flammable Limits. The range of concentration of a flammable gas in air within which a flame can be propagated, with the lowest flammable concentration known as the lower explosive flammable limit (LEFL), and the highest flammable concentration known as the upper explosive flammable limit (UEFL). The minimum and maximum concentrations of a combustible material, in a homogeneous mixture with a gaseous oxidizer, that will propagate a flame. [Extract from NFPA 68]

3.3.17.1 Lower Flammable Limit (LFL). The lowest concentration of a combustible substance in a gaseous oxidizer that will propagate a flame, under defined test conditions. [Extract from NFPA 68]

3.3.17.2 Upper Flammable Limit (UFL). The highest concentration of a combustible substance in a gaseous oxidizer that will propagate a flame. [Extract from NFPA 68]

Substantiation: The NFPA Technical Advisory Committee on Terminology was formed by Standards Council to ensure consistency in definitions within the NFPA system. Definitions must be in single sentences. Moreover, definitions cannot contain requirements. There is no problem with adding annex notes that explain the concept.
further. There is an existing definition of flammable limits that has the same concepts and would bring consistency. It is contained in NFPA 68, Standard on Explosion Protection by Deflagration Venting, and in NFPA 69, Standard on Explosion Prevention Systems.

Committee Meeting Action: Reject

Committee Statement: As currently defined in NFPA 86, the terms are consistent with their use in the industry. The proposed definitions from NFPA 68, Standard on Explosion Protection by Deflagration Venting, will not add clarity.

III. NITMAM

NITMAM Submitted by Marcelo M. Hirscher seeks to change action by the Committee on Comment 86-5 from REJECT to ACCEPT.

IV. Mike Polagye’s Response to NITMAM

The committee reviewed the definition in NFPA 68 as well as its Annex material during both the ROP and ROC meetings and during the ROP meeting adapted text from the Annex material as well as changing terminology from LEL/UEL to LFL/UFL. The definitions in NFPA 68 address a broader spectrum of LFL and UFL scenarios than are addressed in NFPA 86 and as such the definitions, while valid, do not focus on the specific scenarios encountered in ovens and furnaces as addressed by NFPA 86; namely the explosive range of flammable gases in air. The committee’s statement in the ROC for rejecting the comment is proper and correct. Due consideration has been given to adopting the definitions from NFPA 68, but as stated in the committee statement, the NFPA 68 definitions do not aid in understanding the terms for the purpose for which they are used in NFPA 86.
I wish to add an additional concern regarding the subject NITMAM and possible action by the Standards Council.

If the decision is made to apply the NFPA 68 definitions to NFPA 86, the Technical Committee on Ovens and Furnaces is concerned that the new definitions would appear in NFPA 86 for three or more years before Annex material could be published to explain these new definitions as they apply to the scope, content and use within NFPA 86.

It is my understanding that Annex material cannot pass the “emergency nature” criteria required for a TIA, and as such, the needed Annex material would not available to users of the Standard until the edition following the 2011 edition of NFPA 86 is published.

Best Regards,

Ted Jablkowski, P.E.

Eastern Regional Manager
Fives North American Combustion, Inc.
Ted.Jablkowski@fivesgroup.com
Office 860-739-3466
Cell 860-460-3370
Fax 860-739-3469

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Item 10-8-9
ASSOCIATION AMENDMENT 
BALLOT RESULTS 

DATE: July 6, 2010

AMENDMENT

Document: NFPA 204, *Standard for Smoke and Heat Venting*

Motion: To Return Entire Report

TC FINAL Ballot Results

According to 4.7.1 in the NFPA Regs (RGCP), the final results show this Amendment **HAS** achieved the necessary $\frac{2}{3}$ majority vote needed to recommend approval of the Association Action by the Technical Committee.

The number of affirmative votes needed for the report to be published is **13**.

\[23 \text{ (eligible to vote)} - 4 \text{ (not returned)} - 0 \text{ (abstentions)} = 19 \times 0.66 = 12.54\]

In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required.

\[23 \text{ eligible} \div 2 = 11.5 = 12 \text{ (this is the simple majority)}\]

**23 Eligible to Vote**

**4 Not Returned (Avidor, Evans, Sampson, Van Becelaere)**

17 Agree
1 Do Not Agree (Wolin)
1 Abstention (Ferreira)

_Final Action: PASS_
NFPA 204
TC BALLOT for Smoke Management
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

NOTE: This Association Amendment ("Amendment") is being submitted for a ballot of the Technical Committee pursuant to section 4.7.2 of the Regulations Governing Committee Projects ("Reg's"). According to the Regs., whether the results of this ballot agree or disagree with the Amendment, the default recommendation to the Standards Council will be to return to the previously adopted Document. While the Standards Council generally defers to the default recommendation prescribed by the Regs, that recommendation is not binding, and in the event of an appeal to the Standards Council, the Technical Committee ballot results will be reviewed and considered by the Council as part of its deliberations. Under NFPA rules, it is important for you to vote so the Council can take your vote into consideration during deliberations.

☐ Agree
☒ Do Not Agree*
☐ Abstain*

*Please give reasons for voting “Do Not Agree” or “Abstain”:

The original motion that was submitted to reject Comment 204-8 (NITMAM Log#716) was consistent with my negative vote on that comment. I, however, do not agree with returning the entire document. The issues related to the use of smoke and heat vents in sprinklered buildings will not be solved by returning the document to the Technical Committee. While I do not agree with it, Comment 204-8 was a result of significant work within the Technical Committee. If the comment is rejected, Chapter 11 of NFPA 204 should remain as written in the 2007 edition and the document should be published with the other approved changes.

Please return as soon as possible, but no later than Friday, June 25, 2010 to:

Jill McGovern
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: Steven Wolin

Date: 6-25-10

June 2010

Standards Council Supplemental Agenda  August 3-5, 2010  Page 927 of 1603

Revised Page Number 155 of 837
NFPA 204
TC BALLOT for Smoke Management
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

NOTE: This Association Amendment ("Amendment") is being submitted for a ballot of the Technical Committee pursuant to section 4.7.2 of the Regulations Governing Committee Projects ("Regs"). According to the Regs., whether the results of this ballot agree or disagree with the Amendment, the default recommendation to the Standards Council will be to return to the previously adopted Document. While the Standards Council generally defers to the default recommendation prescribed by the Regs, that recommendation is not binding, and in the event of an appeal to the Standards Council, the Technical Committee ballot results will be reviewed and considered by the Council as part of its deliberations. Under NFPA rules, it is important for you to vote so the Council can take your vote into consideration during deliberations.

☐ Agree

☐ Do Not Agree*

☒ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":

Hughes was contracted for consulting for section of NFPA 204 impacted by the NiFMAM. Abstain due to conflict of interest.

Please return as soon as possible, but no later than Friday, June 25, 2010 to:

Jill McGovern
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: Michael Ferrai

Date: 6/24/10

June 2010
Standards Council Supplemental Agenda
Revise the contents of Chapter 11 to retain the basic information that needs to be considered when smoke/heat vents are provided in buildings with an automatic sprinkler system.

Chapter 11 Venting in Sprinklered Buildings

11.1 Scope. This chapter provides requirements for the design of smoke and heat venting systems in buildings protected by automatic sprinkler systems.

11.2* Design Basis. The design of smoke and heat venting systems shall be based on a performance analysis acceptable to the AHJ. (See Section F.3.)

A.11.2 Design objectives for a vent system can include one or more of the following goals:

(1) To provide occupants with a safe path of travel to a safe area
(2) To facilitate manual fire fighting
(3) To reduce the damage to buildings and contents due to smoke and hot gases

11.3* Automatic Sprinkler Systems. The automatic sprinkler systems shall be designed in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems.

A.11.3 Smoke and heat vents shall not adversely impact the performance of the automatic sprinkler system. See NFPA 13, Section 12.1.1

11.4* Buildings Protected by Control Mode Sprinklers.

A.11.4 ESFR Sprinklers – Testing and computer modeling studies conducted to date that have addressed the interaction of smoke and heat vents have utilized control mode sprinklers. Since ESFR sprinklers have not been considered in any such studies, use of the guidance in this document is not applicable to ESFR sprinklers. The response time index (RTI) is considerably lower and the required water discharge per sprinkler is considerably higher than that of control mode sprinklers. There is concern that early operation of a smoke and heat venting system may adversely affect the performance of the fire suppression provided by ESFR sprinklers.

11.4.1* Draft curtains provided in storage areas shall be placed at the longitudinal center of an aisle space. The aisle space shall not be less than 1.5 times the spacing of ceiling sprinklers in the direction perpendicular to the draft curtain. Sprinklers shall be located on both sides of the curtain per NFPA 13 requirements for sprinkler placement with respect to walls. If a full-height partition is used in lieu of a draft curtain, normal aisle spacing shall be permitted.

A.11.4.1. Figure A.11.4.1 shows the recommended spacing of sprinklers with respect to the draft curtain locations.

Vents shall not operate until after sprinklers have been determined to establish control of the fire.

A.11.4.2. Ganged vent operation is designed to simultaneously open all vents within the affected smoke zone. The smoke zone is bounded on four sides by draft curtains and/or walls. It requires the use of pop-up type vents, as thermoplastic drop-out vents are designed to only operate individually. It also requires that an activation system be connected to release mechanisms for each individual vent. The benefit is that it may allow for enough vent area to remove the equivalent volume of smoke calculated for the design fire, whereas, the vent area from one or two individually activated vents would generally not be adequate. In some cases, this may require a significant roof area within the boundaries of a smoke zone to provide a sufficient area of vents. In some cases, the minimum vent area required by local code may not meet the above design criteria.

Ganged vents within the smoke zone of fire origin should not open before sprinklers that will help control the fire have operated. For storage areas, this means that a sufficient time delay should be provided between the time of the first
sprinkler actuation and the time the vents within that smoke zone are opened to allow sufficient time for both the first and second ring of sprinklers around the fire origin to operate. While the first ring of operating sprinklers is important in putting water on the fire, the second ring of operating sprinklers is important to cause pre-wetting of unburned product to thus slow or halt the advancement of the fire. This time delay will vary considerably, depending on the specific details of the stored commodities and sprinkler protection. It takes time for the fire department to respond, deploy hoses and assess the control of the fire, therefore reliance on remote manual operation of such ganged vents may be an alternative to trying to estimate the specific required time delay.

There has been no testing of ganged vent operation to verify its effectiveness.

Because of the additional equipment required, the cost may be significantly higher for ganged venting than that of individually operated smoke vents.

Substantiation: When the Committee Proposal 204-5 (Log #CP2) was developed, the committee recognized there are philosophical differences and viewpoints on the efficacy of having smoke and heat vents in buildings with automatic sprinklers. While some believe the two systems should not be used together, the reality is that some model and state codes and standards require the use of smoke/heat vents in sprinklered buildings. The revised text for Chapter 11 does not require or even suggest that two systems be used together, it simply provides a range of factors that need to be considered, evaluated and built into the design analysis. The committee has drawn on the information previously discussed in Proposal 204-5, information provided in the public comments received and the information contained in the 2010 edition of NFPA 13 concerning smoke and heat vents.

Committee Meeting Action: Accept
Number Eligible to Vote: 23
Ballot Results: Affirmative: 20  Negative: 1  Abstain: 1
Ballot Not Returned: 1  Avidor, E.

Explanation of Negative:

WOLIN, S.: While the proposal would substantially increase the amount of text in Chapter 11, I do not believe that the proposed revisions provide any significant guidance on the use of smoke and heat vents in sprinklered buildings that would not otherwise be addressed in the performance analysis that is already required. The prescriptive requirements outlined in proposed Sections 11.4.1 and 11.4.2 do not appear to be consistent with the fact that Section 11.2 requires the design to be based on a performance analysis. If a designer is required to prepare a performance analysis, then proposed Sections 11.4.1 and 11.4.2 should include factors that must be considered in the performance analysis, with explanatory material in the annex, instead of prescriptive requirements that may or may not be appropriate for the performance design of a specific building.

Explanation of Abstention:

FERREIRA, M.: See my reason for abstaining on 204-6 (Log #1).

Comment on Affirmative:

COMPTON, P.: I agree with the basic principles of the proposal when the purpose of the smoke control system is to assist the fire service or provide property protection. However, when the main purpose of the smoke control system is to protect life during evacuation the proposed delay in operating the smoke control system is not possible. Bearing in mind that this standard may be used internationally and not just in the USA where smoke control for life safety is not unusual we should make clause 11 applicable to as many situations as possible. I suggest that we add an extra sentence that states: When smoke control is used to protect life during evacuation the smoke control system should operate as quickly as possible, preferably from a smoke detection system, regardless of any effect on sprinkler effectiveness. This is normal practice in Great Britain and Europe.
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Figure A.11.4.1

- Storage racks

= Draft curtains

S = Sprinkler spacing in same direction

Example: Sprinkler spacing is 10 ft (3 m) in both directions. Minimum spacing between face of storage and draft curtain is 7.5 ft (2.3 m) so minimum aisle space at draft curtain > 15 ft (4.5 m).
<table>
<thead>
<tr>
<th>Test</th>
<th>Predicted Rate of Venting (kg/s)</th>
<th>Actual Rate of Venting (kg/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VICOH3</td>
<td>80</td>
<td>98</td>
</tr>
<tr>
<td>VICH3</td>
<td>80</td>
<td>99</td>
</tr>
<tr>
<td>VICOH3FCO</td>
<td>68</td>
<td>66</td>
</tr>
<tr>
<td>VICH3FCO</td>
<td>68</td>
<td>82</td>
</tr>
</tbody>
</table>

**Substantiation**: The current edition merely requires that a performance analysis be performed and accepted by the AHJ. The new chapter provides design information to be used in designing systems for sprinklered buildings and provides requirements for the required performance analysis called for in the current text. This expansion of the chapter provides more detailed requirements that will improve the design of vent systems in sprinkled buildings.

**Committee Meeting Action**: Reject

**Committee Statement**: The Committee has developed Committee Proposal 204-5 (Log CP#2) to address the integration of sprinkler systems with smoke/heat vents. The subjects and topics of this proposal have been considered in the development of that proposal. See Committee Recommendation, Action and Statement on Proposal 204-5 (Log CP#2).

**Number Eligible to Vote**: 24

**Ballot Result**: Affirmative: 22, Abstain: 1

**Ballot Not Returned**: 1

**Explanation of Abstention**: EVANS, D.: See explanation for 204-1 - Log #CP1

204-5 Log #CP2 Final Action: Reject (Chapter 11)

**Submitter**: Technical Committee on Smoke Management Systems,
**Recommendation**: Add content to completely replace current Chapter 11 to address the proper integration of sprinklers along with smoke and heat vents.

**Chapter 11 Venting in Buildings Protected by Control Mode Sprinklers**

11.1 General

11.1.1 Scope: This chapter provides requirements for the design of smoke and heat vent systems in buildings protected by control mode sprinkler systems.

A. 11.1.1 ESFR commentary (to be provided later)

11.1.2 Design Objectives: Design objectives shall include one or more of the following:

1. To provide occupants with a safe path of travel to a safe area
2. To facilitate manual fire fighting operations
3. To reduce the damage to buildings and contents due to smoke and hot gases

11.1.3 Where Chapter 11 conflicts with Chapters 4-8, Chapter 11 requirements shall take precedence.

11.1.4 Draft curtains shall be optional, except when a remote vent system is to be used as air supply inlets.

11.1.5 The design fire shall have a steady state heat release rate that is capable of operating the number of sprinklers contained within the design area of the sprinkler system.

A.11.1.5 This specification of the design fire assures that the vent system will be effective under the most challenging fire conditions consistent with successful sprinkler system operation. Note that smoke vents will not be effective in removing fully cooled gases that have no residual buoyancy. This has no impact on smoke vent system design.

11.1.6 Sequence of Operation

11.1.6.1 Smoke and heat vents shall not delay the operation of sprinklers.

11.1.6.2 Vents shall be operated after sprinklers have been determined to establish control of the fire.

A.11.1.6.2 Adequate time is needed before smoke and heat vents are operated to allow control of the fire by the sprinkler system. Sprinklers within a radius of 1 1/2 times the sprinkler spacing may be needed to operate to allow adequate fire control and pre-wetting. The elapsed time between the first sprinkler operation and the last sprinkler that is needed to operate to allow fire control will vary depending on the details of the occupancy and the sprinkler system design. One method of assuring this has occurred is to arrange the smoke and heat vent system to be remotely operated by the fire department after they have established that the fire is being controlled by the sprinkler system.

In some cases, the design objectives of the smoke and heat vent system are such that an earlier or more definitive operation time is needed. In those cases, the designer must assure there is adequate delay in the operation of the smoke and heat vent system after the first sprinkler has operated to allow needed sprinklers to operate. For warehouses, the fire hazard is usually relatively high. This necessitates a greater time delay, but human occupant density is low and the number of stories are generally limited, so egress time may not be a factor. For manufacturing operations, the human occupant load is greater, but the fire hazard may be relatively lower, which would indicate a lesser time delay may be acceptable. In no case should the time delay be less than 1 minute.

11.1.7 Vent and inlet areas shall be determined using algebraic calculations in accordance with Section 11.2 or by use of a computer-based simulation model in accordance with Section 11.3.

11.1.8 The design fire used in the evaluation of a proposed vent design shall be in accordance with Section 11.1 and with actual full scale fire test data or Chapter 8.

11.1.9 Where a vent system is activated by a sprinkler flow switch, all vents in the area covered by the sprinkler flow switch shall operate together.

A.11.1.9 It is permissible for vents over a larger area to be operated together, whether or not separated by draft curtains. This can allow simpler control. If separated by a draft curtain, it can also allow remote vents in other curtain areas to be used as a source of inlet air. When control is manual, there is no restriction on number or area of vents operated together.

11.1.10 The sprinkler system shall be installed in accordance with NFPA 13.

11.1.11 Sprinklers and vents shall be positioned so that no sprinkler is located within the plan area of the vent opening.

11.1.12 Where used, draft curtains shall be placed at the center of an aisle no less than 1.5 times the sprinkler spacing in width. Sprinklers shall be located within the space between the center of the curtain and the boundary of the area protected by the sprinkler system and not more than 6.1 m (20 ft) or less and building heights of 8.2 m (27 ft) or less.

11.2 Algebraic Calculations

11.2.1 Vents systems, other than those complying with Section 11.3, shall be sized and actuated to meet the design objectives in accordance with section 11.2. The algebraic methods of 11.2 shall be used only for storage heights of 6.1 m (20 ft) or less and building heights of 8.2 m (27 ft) or less.

11.2.2 Design Concepts

11.2.2.1 Steady state shall be assumed as illustrated in Figure 11.2.2.1 (similar to figure 9.2.2.1), where symbols are as defined in section 1.6.

11.2.2.3 At the steady state heat release rate, mass flow out of the vents shall exceed the mass flow rate into the smoke layer (m, > m,)

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11.2.3.5 When the mean flame height, $L_{s}$, is below the smoke layer boundary ($L_{s} < z_{s}$), the mass flow rate shall be calculated in accordance with the following equation:

$$m_{s} = \left(0.9056Q_{s}\right)z_{s}/L$$

(11.2.3.7)

$m_{s}$ = mass flow rate in the plume (kg/s)

$Q_{s}$ = heat release rate (kW)

$L_{s}$ = mean flame height above the base of the fire (m)

11.2.3.6 For line-like fires where a long narrow plume is created by a fuel or storage array, the smoke production calculated in accordance with this standard shall be applicable only if the height of the smoke layer boundary above the base of the fire ($z_{s}$) is greater than or equal to four times the highest horizontal dimension of the fire ($W_{f}$).

11.2.3.7 If $z_{s}$ is smaller than $4W_{f}$, the smoke production rate calculated in accordance with this standard shall be increased by the factor $(4W_{f}/z_{s})^{2.5}$.

11.2.3.8 The base of the fire shall be the lowest point of the fuel array.

11.2.4 Mass Flow Rate Through the Vents

11.2.4.1 The mass flow rate through each vent shall be calculated in accordance with the following equation:

$$m_{v} = \left[\frac{C_{v}A_{f}}{1 + C_{v}A_{f}}\right]\frac{\sqrt{2\rho_{a}g^{2}(T_{v} - T_{0})}}{2^{3/2}g^{3/2}}$$

(11.2.4.1)

where:

$m_{v}$ = mass flow through vent (kg/s)

$C_{v}$ = vent discharge coefficient

$A_{f}$ = vent area (m$^{2}$)

$\rho_{a}$ = ambient density (kg/m$^{3}$)

$g$ = acceleration due to gravity (9.81 m/s$^{2}$)

$d_{s}$ = smoke layer depth (m)

$T_{v}$ = ambient temperature in the vent (K)

$T_{0}$ = smoke layer temperature at the vent (K)

$A_{i}$ = inlet area (m$^{2}$) for the individual vent, i.e., the total inlet area divided by the number of exhaust vents.

11.2.4.2 The discharge coefficients for vents and inlets used shall be those provided by the vent or inlet manufacturer. If no data are available, the discharge coefficient shall be taken from Table 11.2.4.3 unless an analysis or data acceptable to the AHJ are provided by the designer to validate the use of an alternate value.

Table 11.2.4.3 Default Discharge Coefficients for Vents and Inlets

<table>
<thead>
<tr>
<th>Vent or Inlet Type</th>
<th>Discharge Coefficient $(C_{v})_{0}$</th>
<th>$(C_{v})_{ad}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Louvered with blades at 90 degrees to airflow</td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td>Flap type or door open at least 35 degrees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drop-out vent leaving clear opening</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flap type or door open at least 30 degrees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed weather louvers with blades at 45 degrees</td>
<td>0.35</td>
<td>0.25</td>
</tr>
</tbody>
</table>

11.2.4.3 The smoke layer temperature, $T_{s}$, used in 11.2.4.1 shall be determined as follows:

Within the area of operating sprinklers, the smoke layer temperature shall be taken as the sprinkler activation temperature (temperature rating), $T_{sr}$.

For vents outside the sprinkler operating area, the temperature shall be taken as:

$$T_{v} = T_{sr}$$

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Report on Proposals F2009 — Copyright, NFPA

\[ T(r) = ABr^{-1} + T_{\text{ext}} \]
where
\[ A = r_{\text{sp}} (T_{\text{ext}} - T_{\text{amb}}), r_{\text{sp}} = \sqrt{A_s / \pi} \]

11.2.4.4 The smoke layer depth used in 11.2.4.1 shall be less than the depth of the draft curtains, where used, or shall be taken as 0.12 H, where draft curtains are not used.

11.2.5 Required Vent Area and Inlet Area

11.2.5.1 The minimum vent area shall be the vent area required to satisfy Section 11.2.2.3.

11.2.5.2 The minimum inlet area shall be the inlet area required to satisfy Section 11.2.2.3

11.3 Models

11.3.1 Vents, other than vent systems designed in accordance with Section 11.2, shall be sized and actuated to meet design objectives in accordance with Section 11.1 and shall use methods described in Section 11.3.

11.3.2 The computer model Fire Dynamics Simulator (FDS) or other approved mathematical models shall be used to assess the effects of the design fire and to establish that a proposed vent system design meets design objectives.

11.3.3 When models other than FDS are used, evidence shall be submitted to demonstrate efficacy of the model to evaluate the time-varying events of a fire and to calculate the effect of vent designs reliably in terms of the design objectives.

11.3.4 The design fire used in the evaluation of a proposed vent system design in accordance with Section 11.3 shall be determined in accordance with Chapter 8 and Section 11.1.2.

Definitions: Definitions to be added to Chapter 3.

Ganged operation: Process whereby multiple vents are opened simultaneously based upon a signal generated independent of the vents themselves. The signal may be generated by a detection system, water flow alarm, or manual means.

Amend title of Chapter 9 as follows:

Chapter 9 Sizing Vents for Non-Sprinklered Buildings

Substantiation: The committee has a long history of trying to define the best practice methods of using smoke and heat vents in buildings that are protected with automatic sprinklers. During this revision cycle, a Task Group was created to look at the issue and to develop a recommendation that would establish a set of design criteria that would factor in the range of variables including but not limited to fire growth, fire size, sprinkler operating times and smoke/heat vent operating times. The proposal in its current form will limit these concepts and design approaches to fire control mode sprinkler system designs.

The committee received the Task Group report at the ROP meeting and, fully recognizing this is still a work in progress, the committee has elected to develop this REJECTED proposal in order to allow further review and vetting of the concepts as they stand now. While all areas of the proposal are open for review and comment, including additional work that will be completed by the aforementioned Task Group, the following items are of particular interest to the committee:

A. Validity of using CFD models to show interface with operating times of sprinklers and the smoke/heat vents.
B. Using FDS to predict operation of first sprinkler, but not for impact of control or suppression features once sprinkler operation occurs.
C. Objectives of the smoke/heat venting system may vary and might include life safety, property conservation, fire fighter safety or some combination thereof.
D. Considering the limits of the design fire specifically, looking at a design fire that simulates the design area of the automatic sprinkler system. For example, a 2,000 ft² area for a 20 ft high Group A plastic commodity on racks.
E. The need for draft curtains in all cases.
F. Impact or simulation of the smoke/heat vents operate before the sprinklers operate, or if the vents cause delay of additional sprinklers operating, what is the impact of the calculated heat release rate?
G. Impact of sprinkler design characteristics such as droplet size and velocity and the influence of smoke and heat vents on these characteristics.
H. Review of the guidelines for determining the smoke layer temperature.

The committee welcomes public comment on these issues and has crafted a plan of action to continue to resolve these issues during the ROP phase.

Committee Meeting Action: Reject

Committee Statement: The committee has addressed the overarching philosophies and concepts involving proper integration of smoke and heat venting criteria in buildings that are protected with automatic sprinklers. Additional refinement to some of the details for the proposal are still needed. The committee as well as the committee Task Group will continue to study this issue with a goal of resolving the outstanding issues during the ROP preparation phase.

Number Eligible to Vote: 24

Ballot Results: Affirmative: 21 Abstain: 2

Ballot Not Returned: 1 Irwin, W.

Explanation of Abstention:
EVANS, D.: See explanation for 204-1 - Log #CP1
FERREIRA, M.: Craig Beyler of Hughes authored the proposed changes, so it is appropriate for me to abstain.

204-6 Log #1 (11.1.2)

Final Action: Reject

Submitter: Justin B. Miller, Roanoke County Office of Building Safety

Recommendation: Add new text as follows:
11.1.2 When acceptable to the AHJ, automatic smoke and heat vents shall not be required in sprinklered areas of buildings that are equipped with early suppression fast response (ESFR) sprinklers installed in accordance with NFPA 12.

Substantiation: Note: This proposal was developed by the proponent as a member of the Building Code Development Committee (BCDC) with the committee's endorsement.

It has been suggested in several fire studies related to this subject, as included in the annex section F supplemental material of this standard, that automatically operated smoke and heat vents in areas of a building equipped with ESFR sprinklers could have a detrimental effect on sprinkler operation. There is concern that heat could be displaced during a fire by the activation of vent(s), thus delaying the activation of the sprinklers and diluting the effectiveness of ESFR sprinklers intended to suppress the high storage fire arrangement. While it is acknowledged that section 11.1 does not specifically mandate the installation of smoke and heat vents in the areas protected by ESFR sprinklers, this proposed language would only highlight the additional concern facing the designer providing the performance analysis in such protected areas and clarify the intent of the installation standard. The value of smoke and heat vents is recognized for fire fighting purposes, so only “automatic” smoke and heat vents are addressed; it may be a visible operation to provide manually operated vents to provide the tools needed for the emergency responders in a fire event. By using the verbage "not required" and "acceptable to the AHJ," this proposed section would not prohibit the installation of automatic smoke and heat vents; such a change would be better suited for the building or fire code referencing this standard.

Committee Meeting Action: Reject

Committee Statement: The committee notes that it is not up to NFPA 204 to determine the circumstances under which smoke and heat vents should be required. That determination needs to be made by the building code or other occupancy standard that specifies the need for such features or components.

NFPA 204 is charged with establishing the appropriate level of design criteria when smoke/heat vents are specified for use by some other source document.

The Committee has developed a Committee Proposal 204-5 (Log #CP2) to address the design principles associated with the use of smoke/heat vents in buildings protected with automatic sprinklers. For the ROP stage, the committee is limiting the criteria to control mode sprinkler systems only.

If possible, the committee would be interested in receiving a copy of the fire studies noted in the substantiation for this comment.

Number Eligible to Vote: 24

Ballot Results: Affirmative: 22 Abstain: 1

Ballot Not Returned: 1 Irwin, W.

Explanation of Abstention:
EVANS, D.: See explanation for 204-1 - Log #CP1
RANDOLPH TUCKER: Mr. Chair, ladies and gentlemen, the report of the technical committee on the smoke management systems is presented for adoption. It can be found in the report on proposals for the 2009 fall media revision cycle reprinted in the annual 2010 report on comments.

The technical committee has published a report consisting of a partial revision of NFPA 204, standard for smoking (indiscernible).

The presiding officer will now proceed with the certified amending motions.

RALPH GERDES: Thank you, Mr. Tucker. We're now going to proceed with motion sequence 204-1.

Microphone 5.

DAN O'CONNOR: Thank you, Mr. Chairman. Good afternoon. My name is Dan O'Connor. I am the chief technical officer for Schirmer Engineering Corporation and I would like to move that we reject Comment 204-8.

RALPH GERDES: Do we have second?

(Second.)

RALPH GERDES: We have a second.

Proceed.

DAN O'CONNOR: As I begin my discussion here, I
think what I'd first like to do is I would ask you if
you have your ROC with you to look to pages 204-3 and
204-4 of the report on comments. That's where you will
find Item 204-8, the item that I am moving to reject
here.

So where are we going here? My comment here is
that the technical basis for designing vent systems and
sprinkler buildings has essentially been investigated
now for more than 25 years and has not yet been
developed in this proposal for Chapter 11.

However, this proposal would give basically de
facto recognition that sprinklers and vents can
successfully be used together if you do some type of
performance based design.

The text is not very specific. It's, I
believe, unenforceable and also I find that it would
place a substantial burden on local authorities to
review and approve such designs. Despite the lack of
substantiation and specificity of how to design such
systems, proponents vented sprinkler buildings, I
believe, are misrepresenting this proposal as finally a
solution to the long-time challenge of combining
sprinklered buildings with automatic smoking heat vents.

I'd like to draw your attention to one specific
paragraph in this proposal that you would find on -- in
the report on comments on page 204-4, and that is
section of this proposal 11.4.2. That section reads as
follows: "Vents shall not operate until after
sprinklers have been determined to establish control of
a fire."

Okay. This is -- needs to be done in the
context of a performance based design here in order to
use automatic vents. In this day and age, we see right
now the important stage of the RT's full-scale test
being done routinely to determine if height challenge
and storage occupancy scenarios sprinklers can control a
fire for those scenarios without the vents present.

These tests aren't being routinely done with
vents in this. And yet this section of 204-8 is saying
we have to have determined when those sprinklers would
have established control of the fire. Through
full-scale testing, we're just trying to determine if
the sprinklers without the vents can control the fire.

So at this time what I'd like to summarize with
right now, in my mind as I read this 204-8, there's
really no reasonable engineering expectation or accepted
calculation method that allows the point of sprinkler
control to be predicted on a reliable and repeatable
basis, especially given the wide variety of variables
possible in storage configurations.
In fact, I think if you were attending during the week, you would have noticed on the presentation agenda the number of presentations dealing with sprinklers and height challenge and storage occupancies. And particularly one I saw yesterday by Steve Mazur (phonetic) from Chubb (phonetic) regarding the number of variables that could affect sprinklers minus the consideration of having automatic vents. So based on this and our inability to do this, the burden it puts on the HJ, I would ask you to reject Comment 204-8.

Thank you.

SHANE CLARY: Thank you.

Mr. Tucker.

RANDOLPH TUCKER: Yes. In response to you, the technical committee has put together a task group to study the issues of using vents with sprinkler systems design, and I'm going to ask the chair of that task group, Dick Davis, to respond to the committee.

DICK DAVIS: Dick Davis, FM Global, speaking against the motion.


DICK DAVIS: All right. Take it from the top.

Dick Davis, FM Global, speaking against the motion.

Comment 204-8 provides considerable improvement over the existing language in the 2007 version of 204.
1 Admittedly we could not get consensus agreement on all
2 the needed details with regard to the design of smoke
3 and heat vents in sprinkler buildings.
4           In fact, some of the members on the committee
5 don't feel that even smoke vents should be required in
6 sprinkler buildings. But at the end of the day, 204
7 does not require heat and smoke vents to be installed
8 anywhere. Other model codes and local codes do.
9           The majority of the committee members did feel
10 that if heat and smoke vents were -- and drafters were
11 required in sprinklered buildings, that they should not
12 adversely affect the sprinkler operations. So really
13 the goal of this comment of -- the primary goal to
14 assure that the installation of smoking vents and draft
15 curtains not adversely affect the sprinkler performance.
16           There were several items added in the
17 requirements and annex notes that attempt to do this.
18 They include, first of all, requirement for the location
19 of the draft curtain and the width of the aisle that
20 this should be centered over. Currently the only
21 requirements in IBC or IFC are for the draft curtain
22 depth. There are no requirements for the location of
23 the draft curtain with respect to an isle space.
24           Tests done by Joan Troop in 1994 at FM Research
25 suggest that draft curtains not installed with
requirements in Comment 204-8 could cause a considerable increase in the number of sprinkler heads operating. They were conducted two sets of tests where the protection of storage were identical except that in the second test, the draft curtain did not comply with the requirements that are proposed for 204-8. The number of sprinklers in the first set of tests increased from 4 to 35 heads with the inadequate draft curtain location.

In the second set of head tests, the number of heads operating increased from 7 to 18 with the draft curtain being improperly located with respect to the proposed requirements in 204-8.

Furthermore, in 1998 there was an NFPA investigation report entitled "Bulk Retail Storage Fire" in Tempe, Arizona and the information in that report suggested that the draft curtain which was not in conformance with these proposed requirements channeled heat away and caused sprinklers to operate well beyond the fire where they're not putting water on the fire or even effectively causing pre-wetting.

The -- in addition, there's an annex note to state that none of the tests that have been conducted to date consider ESFR quick response sprinklers, so we added an annex note to say that this document does not apply to ESFR quick response sprinklers.
In the note that Dan O'Connor commented on, specifically 11.4.2, vents shall not operate until the sprinklers have controlled the fire, admittedly it is a difficult situation to try to police.

We had extensive discussions during the task group meetings and the committee meetings. The original proposal was for a one-minute time delay between the first sprinkler operating and the vents opening. The task group and committee did not agree that that was adequate. We added considerable discussion in the annex to help people arrive at a reasonable decision.

We talked about the importance of allowing the first ring of sprinklers to open and put water on the fire; the second ring of sprinklers to cause pre-wetting to prevent the advancement of the fire; and in the end of the discussion where we included an explanation of (indiscernible) vents and what that concept is, we even suggested an alternative that manual remote operation of events be considered that would take away the concern that is presented in item 11.4.2.

If this proposal is accepted, we will revert back to the language that's in 2007, and I don't believe that that's really going to help us. What it says is that Chapter 11 is basically one paragraph. It says venting and sprinkler building.
It says, "Where provided to design for venting and sprinkler buildings shall be based on a performance analysis acceptable to the AHJ demonstrating that the established objectives are met."

So I really don't think that that's anymore enforceable than what we proposed in 204-8.

RALPH GERDES: Thank you.

We'll continue at Mic 2.

BILL COPPEL: Bill Coppel, Coppel Associates.

Member of the committee but not speaking for the committee and also representing today and on the committee, the (indiscernible) task group and we would encourage you to vote against the motion on the floor.

I think the real issue before you today is is this better than what's in the 2007 edition of the standard. What is proposed in the new Chapter 11 coordinates and references text in NFPA 13 2010 edition.

Now, that's important because previous editions of NFPA 13 clearly said not to use vents -- it didn't say not to use vents, what it said is we're not giving you the design criteria if you use vents. So there's some new language in Chapter 12 and then will, in fact, coordinate I believe with the requirements and the language in NFPA 13.

You've already heard testimony relative to the
1 added language on draft curtains that will be lost if
2 you accept this motion. The annex note on gang vents
3 and gang vent operation, that's a new annex note. That
4 language, too, will be lost if you support or if this
5 motion is successful. So there are things that you will
6 be losing that apparently the committee believes and
7 certainly the industry believes are beneficial.
8
9 Now, the maker of the motion says that this
10 will present an undue burden on code officials. As
11 you've heard, there are code requirements and there are
12 alternatives in existing NFPA and ICC documents that
13 result in the provision or inclusion of vents in
14 sprinklered buildings.
15
16 Now, as a code official, is there more burden
17 on 204 being totally silent on the issue, except for
18 Annex F, or to have at least this language in here
19 giving you some reference towards the performance
20 analysis, the design objectives, what to do with draft
21 curtains, and the annex relative to gang vents, is that
22 more of a burden than if we're totally silent? I don't
23 think so.
24
25 The maker of the motion says the industry
26 believes that there's a solution. Nothing further from
27 the truth. I'm representing the industry. We think
28 this is a baby step forward. We think there are strides
to be made yet, but we would encourage you to allow us
to build upon this in the next edition of NFPA 204 and
not take us back to where we were several years ago and
have to start from scratch.

So I think the real question for you today
relative to this motion is: What is the harm? Has the
maker of the motion proven to you that there's anything
technically wrong or that any harm will really come from
including Chapter 11 in this edition of NFPA 204? We do
not believe that there is. We encourage you to support
your committee and oppose the motion on the floor.

RALPH GERDES: Thank you.

Mic 5.

CARL BALDASSARRA: Good afternoon. I'm Carl
Baldassarra with the RJA Group and speak in support of
the motion, and I ask those in attendance to do so as
well. I'm very surprised to hear what I just heard,
that this might not do any harm so you ought to support
it, you ought to oppose the motion. That's not the
standard that NFPA holds in its higher regard.

We heard Jim Shannon on Monday say the world
relies on NFPA's reputation for sound technical
decisions as reflected in its standards. This proposal
does not move us forward in any way. It takes the vague
language out of the appendix and moves it into the body.
1 It provides no additional guidance for the designer.
2 I am currently the chair of a task group within
3 the ICC which studied the requirements in the IBC and
4 IFC over the last three years. I'm not speaking on
5 behalf of that committee or the ICC, but we did
6 recommend a major change which would have adopted NFPA
7 204 by reference for non-sprinkler buildings and would
8 have required mechanical systems for sprinkler
9 buildings.
10 There was a consensus of this among the
11 manufacturers, the design community, the fire service,
12 building officials. However, because of some concern
13 and confusion about this proposal that was in NFPA 204,
14 a number -- and a number of other issues which I won't
15 go into right now because of time limitations, the
16 proposal was not adopted in this past cycle. It was
17 very close. I'm going to continue to work hard to see
18 that it gets done.
19 RJA has no financial interest in this issue.
20 I'm confident we're moving towards a consensus on this.
21 The representatives of the -- from the vent industry
22 said at the ICC meeting that they wanted to have another
23 cycle to get this right.
24 It's not right, and this proposal doesn't make
25 it any better. Approval of the NITMAM will, in fact,
allow a motion to be made, and I will make that motion

if this is approved, to return this entire document back
to the technical committee. This will allow the
technical committee to delete the ambiguous language and
keep the good language.

If we want to move this forward, approval of
the NITMAM and the motion to send the document back to
the committee will allow us to move forward in the baby
steps that Mr. Coppel talked about.

This can be done in the short period of time.

It does not require an entire cycle. So working
together we can have an adoptable standard for the IBC
and the IFC in the next IFC -- ICC cycle. If we don't,
we'll continue to have nothing enforceable for another
three to six years. Thank you.

RALPH GERDES: Thank you.

Mic 5.

DAN O'CONNOR: Dan O'Connor, again, Schirmer
Engineering. I have a couple comments here. I
certainly understand that Dick from FM had an -- perhaps
a difficult task in trying --

RALPH GERDES: Are you speaking for or against
the motion?

DAN O'CONNOR: I am speaking for the motion.

Thank you.
That Dick had a difficult time trying to put together this section, particularly given the stance of his employer on this issue here. Now, one of the things I think people would like to understand is that, you know, Schirmer Engineering, we've had a policy of not allowing the -- our clients to go forward and use sprinklers and automatic vents in concert. I think (indiscernible) Mutual also has the same policy. In fact, before I came to this meeting, it was interesting to me to pull out their 2010 installation guidelines for automatic sprinklers dealing with heat and smoke vents. Those guidelines, in fact, say do not install automatic smoke and heat vents in facilities equipped with sprinkler protection. Manual heat and smoke vents, however, acceptable. And I think Dick pointed out that he, in fact, created some appendix language to try to point people in this direction away from automatic vents and two manual vents.

So what else does that criteria say? FM criteria says if you have vents in your building, install quick response sprinklers directly under the vent opening on a maximum 4-foot linear and 16 square foot area spacing. What does that do? That absolutely
prevents the automatic heat vent from opening.

They also say install FM approved vents equipped with a standard response 360 degree nominal thermal activating device. What does that do? That absolutely prevents the automatic vent from opening.

They also say you can install the vents that are FM approved for occupancies protected by quick response storage sprinklers. What does that do? That absolutely prevents the automatic vent from opening.

My point here is I am -- we -- I have not seen the data. I am very concerned that we have major insurance companies in this country that do not accept the use of vents and they have their own guidelines against it, and yet we have a requirement here that says we have to determine so open the vents automatically, the point of whether those sprinklers are controlling the fire before the vents open.

Is there anybody in this room that can come up to me and talk to me this afternoon and explain to me the technical scientific of physics, the basis for how we determine the control of that when all we do nowadays is use full-scale testing to determine the sprinkler control for these occupancies and we do it without vents.

I urge you again that this -- I think this is
bad science to be moving in this direction, and it's
counter to the goals of NFPA, and I urge you to reject
Comment 204-8.

RALPH GERDES: Thank you.

Mic 2.

BILL COPPEL: Bill Coppel, Coppel Associates,
consultant to the (indiscernible) smoke fan task group
and again speaking in opposition to the motion and
rebutting some of the comments you've heard.

I think my previous testimony was
mischaracterized. I didn't say move this forward
because there's no harm. I think what you heard me say
is here are at least three benefits to this language and
we should move that forward because the other doesn't
cause any harm. It says, in fact, there is a benefit.

I also think there's been some
misrepresentation of what happened in the ICC process
because you heard part of the story. The ICC code
technology committee, yes, they moved forward a proposal
that only recognized 204 in non-sprinklered buildings.
The committee modified that to allow the use of 204 in
sprinklered buildings.

The CTC reinvestigated that issue and said we
have a problem because we have to act on this at our
hearings in May, and 204 is not going to be finalized so
they said drop this reference to 204. But they retained
an exception that said smoke vents may be used in
sprinklered buildings when in accordance with NFPA 13
and the chair of the CTC personally said to me that
gives us the ability to reference 204 when 204 is
available to be adopted.

Now, yes, in Dallas what happened is because it
requires a two-thirds vote to get that modification,
that failed and it ended up that everything went away.
So where does that leave us? A requirement for smoke
vents in sprinklered buildings with no standard that
gives us any guidance on how to do anything.

So, again, I'll ask the question: Does the
language here help you as a code official, help you as a
design professional, help you as a facility operator get
you at least some material to work with if you have a
code that says you have to have vents?

A lot of the past testimony you just heard was
the argument about whether we should have vents or not.
That's not this argument. 204 does not require vents.
It tells us here are the things to consider if you have
to put vents in.

Again, we would encourage you to support the
committee and oppose the motion on the floor.

RALPH GERDES: Thank you.
CARL BALDASSARRA: Carl Baldassarra, RJA Group, speaking in support of the motion. Does this language here help me as a designer as just asked rhetorically?

No, it does not. I've been in this business for a long time. I was on the NFPA 204 committee in the '70s and '80s.

I'm not going to put my stamp and seal on a design that says the vents are going to open after the fire is now controlled after "X" number of minutes.

Think about this. Can you look at any building that has a sprinkler system in it and predict when the fire in that building is going to be under control? You can't do that. Too many variables.

This is not better than what's in the current text, and I am proposing to this group an opportunity to make it better as purported by Mr. Davis, Mr. Coppel, and Mr. O'Connor all together. Approve the NITMAM, make a motion to send the document back to the committee, and this can be fixed in a year.

I did not intend to misrepresent what happened at ICC. I want to get this fixed. This will be -- this can be fixed and be in place before the next cycle of the IBC if this NITMAM is approved and a motion is made to send this back to the technical committee and address...
the good parts, take out the bad parts. Thanks.

RALPH GERDES: Thank you.

I see no further discussion on the floor. I'm going to ask Mr. Tucker if he has any final comments.

RANDOLPH TUCKER: Yes. The only final comments: The committee does want to give direction to the industry. What the committee put together, the task group put together is the best information we have at this time. We're certainly open.

If it does get returned to committee, we have a meeting coming up in November, we can re-look at this and see if we can do something better than what we have right now, but the committee's vote on the thing was to go forward with what we have.

RALPH GERDES: Thank you.

With that we are going to proceed with the vote. The motion before you is to reject Comment 204-8. All those in favor of the motion, please raise your hands.

(Raising Hands.)

RALPH GERDES: All those opposed, raise your hands.

(Raising Hands.)

RALPH GERDES: That motion carries.

Any further discussion?
Mic 5.

CARL BALDASSARRA: Mr. Chairman, Carl Baldassarra, RJA Group, in keeping with my previous commitment, I'll make a motion to return the document to the committee.

(Second.)

RALPH GERDES: That motion is in order.

Microphone 5.

DICK DAVIS: Dick Davis, FM Global. I also support the motion to return it back to the committee.

Comment 204-8 was the only substantial change, and I don't want to miss the opportunity to add the good language such as the information on the draft curtains for another three years.

As Randy indicated, we have another committee meeting coming up. We have an opportunity to address this, and I would like to have an opportunity to put in the good information that we have in there and address the problems that Carl and Dan have brought up this afternoon.

RALPH GERDES: Thank you.

I want to ask that Mr. Tucker, if he has some comments at this point.

RANDOLPH TUCKER: The only comments is I will agree with the motion on the floor to return.
RALPH GERDES: Thank you.

Seeing no further discussion, we're going to proceed with the vote. The motion is to return the entire document back to the committee. All those in favor raise your hands.

(Raising Hands.)

RALPH GERDES: Thank you.

Opposed?

That motion carries.

Thank you, Mr. Tucker.

The next motion on the agenda is for NFPA 276, standard method of fire test for determining the heat release rate of roofing assemblies with combustible above-deck roofing components.

However, the authorized maker of the motion has notified NFPA that they no longer wish to present this motion. Therefore, in accordance with NFPA rules, the motion may not be considered by the assembly and is removed from the agenda.

The document will not be considered at this meeting and instead becomes a consent document that will be forwarded directly to the standards council for issuance or other action. We would like to thank the committee for their work on this document. We will now move on to the next document.
MEMORANDUM

TO:    LINDA FULLER
FROM:  TRACY GOLINVEAUX
SUBJECT: NFPA 204 SMOKE AND HEAT VENTING
DATE:   7/23/2010

As result of the floor vote during the Association Technical Meeting in Las Vegas, NFPA 204, *Smoke and Heat Venting* was returned to the SMO-AAA committee. The committee and chair agree to process the document through the Annual 2011 cycle. They will have a new ROC meeting only - opening for new public comments and creating new committee comments.

Tracy L. Golinveaux
National Fire Protection Association

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Item 10-8-10
Dear Amy:

I hereby want to appeal to Standards Council against the membership vote opposing NITMAM 214-1, which was a motion to revise NFPA 214, Standard on Water-Cooling Towers, by rejecting the revision of the definition for “fire-resistant partition” proposed by the technical committee in Comment 214-1 and which introduces the added clause “in accordance with Section 4.9”. The reason that I believe that Standards Council should support this appeal is that the NFPA Manual of Style states that definitions cannot contain requirements and the added clause does not provide any logical clarification of the concept but simply incorporates a requirement which is contained in “Section 4.9” of the standard. The concept of the definition is perfectly clear without the added clause. This is the type of action that results in needless inconsistency in definitions and goes against the stated intentions by the Standards Council for the Glossary on Terminology and against the Manual of Style. The existing definition within NFPA 214, as shown below, is perfectly suitable and should not be replaced by the one proposed by the committee in Comment 214-1. See both definitions below.

3.3.6* Fire-Resistant Partition. A tight, continuous partition suitable for use in a cooling tower environment that has a fire resistance rating of 20 minutes or more in accordance with Section 4.9.

Yours sincerely

[Signature]

Marcelo M. Hirschler
214-1 Log #CC1
(3.3.6 Fire-Resistant Partition)

Final Action: Accept

Submitter: Technical Committee on Water-Cooling Towers,

Comment on Proposal No: 214-3

Recommendation: Revise definition of Fire-Resistant Partition to read as follows:

3.3.6 Fire-Resistant Partition. A tight, continuous partition suitable for use in a cooling tower environment that has a fire resistance rating of 20 minutes or more in accordance with Section 4.9.

Substantiation: This change clarifies the requirements for a 20-minute partition, while in keeping with the Manual of Style.

Committee Meeting Action: Accept

Number Eligible to Vote: 18

Ballot Results: Affirmative: 14

Ballot Not Returned: 4 Berryhill, J., Pinigis, P., Schwind, G., Smith, Jr., R.
214-3  Log #2  Final Action: Reject
(3.3.6 Fire-Resistant Partition)

Submitter: Ken Mortensen, SPX Cooling Technologies

Recommendation:  Add new text to read as follows:

3.3.6* Fire-Resistant Partition.  A tight, continuous partition suitable for use in a cooling tower environment that has a fire resistance rating of 20 minutes or more per NFPA 251 test method (or ASTM E119 or UL 263).

Substantiation:  This section does not define the approval test method.

This is not original material; its reference/source is as follows:

Bob Petterson, SPX Cooling Technologies

Committee Meeting Action:  Reject

Committee Statement:  Conflicts with the Manual of Style (2.3.2.4), which disallows referencing of other documents in Chapter 3 definitions.

Number Eligible to Vote:  18

Ballot Results:  Affirmative: 15

Ballot Not Returned:  3 Berryhill, J., Schwind, G., Smith, Jr., R.

Comment on Affirmative:

MORTENSEN, K.:  In reviewing this action, because Manual of Style excludes document reference, the intent to define the 20 minute or more standard should include words such as “as defined later in the document” or “as defined in Section 4.9.1.” This would not conflict with the Manual of Style and accomplish the purpose. I think these words could be added by the committee or in comment stage.
1  Motions Committee Report behind me on the screen.

    Mr. Spencer will be stepping down as chair due to the ten-year policy. I would like to express mine and our sincere thanks for his leadership on the Committee. We will now proceed in the order of the motion number presented. Mr. Spencer.

    MR. SPENCER: Thank you, Mr. Chair.

    Mr. Chairman, ladies and gentlemen, the Report of the Technical Committee on Water Cooling Towers is presented for adoption and can be found in the Report on Proposals and Report on Comments for the 2009 Fall Meeting Revision Cycle.

    The Technical Committee has published a report consisting of a partial revision of the NFPA 214 Standard on Water Cooling Towers. The presiding officer will now proceed with the certified amending motion.

    CHAIR FARR: Thank you, Mr. Spencer. Let's now proceed with the discussion on the certified amending motions on NFPA 214. Microphone 5, please.

    MR. HIRSCHLER: Marcelo Hirschler, GBH International, for the Glossary Technical Committee.

    And I move to reject Comment 214-1.

    CHAIR FARR: Thank you. There is a motion on the floor to reject Comment 214-1. Is there a
second? We do have a second. Please proceed with
the discussions on the motion.

MR. HIRSCHLER: This is very simple. If you
look at the blue book on page 214-1. Well, actually,
there's two 214-1's, but the second 214-1, which
shows the only comment in here. And the comment that
was put by the Technical Committee was to add the
words "in accordance with section 4.9" on the
definition of "fire resistant partition."

That is not in keeping with the manual of
style. The manual of style says the requirements
shall not be included in the definition.

And also I want to point out, like we
discussed earlier today, that definitions are going
to go into the general glossary of terms. And in the
general glossary of terms, you're going to see
something that says "a fire resistant partition is a
continuous partition suitable for use in accordance
with Section 4.9. That has nothing to do with the
general concept. The concept has to go in the body
of the text, not in the definition. Thank you.

CHAIR FARR: Mr. Spencer, would you like to
offer the Committee's position?

MR. SPENCER: Yes, Mr. Chair. The Committee
feels that the change that it made to the definition
during the ROC process clarifies the requirements for
the partition. While being in keeping with the
manual style by not adding the mandatory "shall"
requirements to the definition.

During the ROC voting process, the Committee
voted unanimously in support of the definition
change. Of 18 voting members, 14 ballots were in the
affirmative and 4 were not returned.

Subsequent to the receipt of the NITMAM, a
teleconference meeting was held to discuss the
motion. While a limited number of members were
available to participate, the voting members who did
participate voted unanimously against the motion.

CHAIR FARR: Thank you, Mr. Spencer. With
that, we will open up the debate on the motion.
Please provide your name and affiliation and whether
you are speaking in support of or against the motion.
Microphone 2, please.

MR. ISMAN: Thank you, Mr. Chair. Ken Isman
with the National Fire Sprinkler Association, member
of the Water Cooling Tower Committee, speaking
against the motion.

I have a great deal of respect for what
Marcelo is trying to do in rather zealously defending
the Glossary of Terms Task Group's work. But the
A fundamental principal on which the Glossary of Terms Task Group was actually put together was to make sure that objects within the NFPA system that are the same have the same definitions.

And then the corollary to that fundamental premise is that objects that are different are allowed to have different definitions. And here we have a situation where an object is different. The fire resistant partition that we're talking about here for a water cooling tower is not the same as a fire resistant partition that you find in a building code or other places. The materials are not compatible that you use. You make this wall out of (indiscernible) versus what you put in a water cooling tower. So we appropriately have a different definition in water cooling towers than you would find for fire resistant partition in other places.

Now, Marcelo has brought up this issue of the Glossary of Terms. When the Glossary of Terms gets printed, he's thinking this is going to be some kind of a concern because it's going to reference some other piece of the standard. But that really isn't going to be a problem.

The purpose of the Glossary of Terms in not to pull things out of context from the documents that
they're actually drawn from. The point of the
Glossary of Terms is to pull together this list and
help people understand the differences between these
different objects when they're put out there.
So it's completely appropriate for the Water
Cooling Tower Committee to have written this
standard. We are in keeping with the manual of style
in that we're not putting the requirements in the
definitions, but we're pointing people towards where
they're going to find more information on how to make
this fire resistant partition for the water cooling
tower environment.

CHAIR FARR: Microphone 4, please.

MR. FISK: Thank you. I'm Bill Fisk of
Intertech, and I'm speaking against the motion.
The maker of the motion stated, among other
things, that it would be inappropriate to add in
accordance with Section 4-9, as that would constitute
a requirement as part of the definition.

Reading the existing definition, "a tight
continuous partition." That contains a requirement.
"Suitable for use in a cooling tower environment."
That contains a requirement. "That has a fire
resistance rating of 20 minutes or more." That's a
requirement. So maybe by adding another thing,
that's making a bad situation worse. But I don't see
that this makes it really any worse.

CHAIR FARR: Microphone 9, please.

MR. HAGUE: Thank you, Mr. Chairman. David
Hague with Liberty Mutual Properties, speaking in
favor of the motion on the floor.

The definition already does not meet the
manual of style because it uses the word "suitable,"
which is not intended for use in the main body of the
document. It establishes a requirement by insisting
on 20 minutes or more for a fire resistance rating.
And as proposed in the comment, adding an index
reference is not appropriate in the main body of the
standard. That should be added in the annex of the
document. So that is not consistent with the manual
of style.

I don't believe the argument is related to a
specific definition for fire resistant petition in a
cooling tower. That is very specific. There's
nothing wrong with that at all. But the definition
overall does not meet the manual of style.

So, again, I would urge the membership to
support the motion on the floor. Thank you.

CHAIR FARR: Microphone 5, please.

MR. HIRSCHLER: Marcelo Hirschler, GBH
International, for the Glossary Committee. I would point out I understand that this Committee wants to have a specific definition of "fire resistant partition." And it's very clear. It's a partition suitable for use in a cooling tower environment. But in accordance with Section 4.9, that is certainly a requirement. That is certainly something that cannot be discussed generically. It cannot be part of the definition. Please support this motion. Thank you.

CHAIR FARR: Microphone 4.

MR. SMITH: Bob Smith. I'm on Technical Committee 214. I just want to make one clarifying point. The Committee at the time and now also believes that this is acceptable to refer to this section in the definition. And we actually feel we are in compliance with the manual of style.

And, in fact, just looking up quickly, we found several references to NFPA 2009 Edition. 101 has the same application when referencing within a definition, and as does NFPA 30, 2008 version or edition.

So we do feel that we were actually in compliance with the style and were very consistent in doing so.

CHAIR FARR: Thank you. Seeing no more
comments from the floor, Mr. Spencer, any final
comments?

MR. SPENCER: I have nothing further,
Mr. Chair.

CHAIR FARR: Seeing no further comments,
before we vote, let me restate the motion. The
motion on the floor is to reject Comment 214-1. All
those in favor of the motion, please indicate by
raising your hand. All those opposed to the motion,
please indicate by raising your hand. Motion fails.

Mr. Spencer, thank you.

MR. SPENCER: Thank you, Mr. Chair.

CHAIR FARR: The next report under
consideration this morning is that of the Technical
Committee on Road, Tunnel and Highway Fire
Protection. Here to present the committee report is
Committee Chair William Connell, of Americas,
Incorporated, Boston, Massachusetts.

The Committee Report can be found in the
blue 2010 Annual Revision Cycle ROP and ROC. The
certified amending motions are contained in the
Motions Committee Report and behind me on the screen.
We will proceed in the order of the motion number as
presented. Mr. Connell.

MR. CONNELL: Mr. Chair, ladies and
Item 10-8-12
ASSOCIATION AMENDMENT
BALLOT RESULTS

AMENDMENT

DATE: July 6, 2010

Document: NFPA 502, *Standard for Road Tunnels, Bridges, and Other Limited Access Highways*

Motion: To Accept Comment 502-45

TC FINAL Ballot Results

According to 4.7.1 in the NFPA Regs (RGCP), the final results show this Amendment **HAS** achieved the necessary 2/3 majority vote needed to recommend approval of the Association Action by the Technical Committee.

The number of affirmative votes needed for the report to be published is **10**.

\[ 19 \text{ eligible to vote} - 5 \text{ (not returned)} - 0 \text{ (abstentions)} = 14 \times 0.66 = 9.24 \]

In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required.

\[ 19 \text{ eligible} \div 2 = 9.5 = 10 \text{ (this is the simple majority)} \]

19 Eligible to Vote
5 Not Returned (Barry, Dix, Ingason, Rohena, Sprakel)

14 Agree
0 Do Not Agree
0 Abstain

Final Action: PASS
Amendment: Accept Comment 502-45

☐ Agree

If you agree with this amendment, the result will be to revise text to read as follows:

3.3.31* Noncombustible Material. (no proposed change to the definition)

A.3.3.31 Standards other than ASTM E 136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C, exist that are used to assess noncombustibility of materials. They include ASTM E 2652, Standard test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C with a Cone-Shaped Airflow Stabilizer, ISO 1182, Reaction to Fire Tests for Building and Transport Products - Non-combustibility Test, and BS 476-4, Fire Tests on Building Materials and Structures. Non-combustibility Test for Materials. Other Equivalent Standards include:

DIN 4102
EN 13501-1
BS 476 Part 4
EN ISO 1182


☐ Do Not Agree*

If you do not agree with this amendment, the recommendation is to return to previous edition text, if any. Since there was no A.3.3.31 in the previous edition, the text is deleted.

☐ Abstain*

*Please give reasons for voting “Do Not Agree” or “Abstain”:

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617- 984-7110

Signature: ________________________________

Name - Please Print: ________________________________

Date: ________________________________

June 2010
Submitter: Marcelo M. Hirschler, GBH International
Comment on Proposal No: 502-13
Recommendation: Revise text to read as follows:

3.3.31* Noncombustible material (no proposed change to the definition)

A 3.3.31 Standards other than ASTM E 136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C, exist that are used to assess noncombustibility of materials. They include ASTM E 2652, Standard test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C with a Cone-Shaped Airflow Stabilizer, ISO 1182, Reaction to fire tests for building and transport products - Non-combustibility test and BS 476-4, Fire tests on building materials and structures. Non-combustibility test for materials. Other Equivalent Standards include:

- DIN 4102
- EN 13501-1
- BS 476 Part 4
- EN ISO 1182


Substantiation: The referenced standards in this annex note are not necessarily equivalent to ASTM E 136 and some of them do not assess the same properties as ASTM E 136.

For information, I show the titles of the other standards:

- EN 13501-1:2007 Fire classification of construction products and building elements. Classification using data from reaction to fire tests
- DIN 4102 Fire behaviour of building materials and components. This standard has 23 parts, none of which assess non combustibility.
- Almost every ISO standard is also issued as an EN standard, because of the treaty between ISO and CEN. Therefore the proper reference is to the ISO standard.

The ASTM E 2652 standard has recently been issued by ASTM committee E05 and is equivalent to ISO 1182.

Committee Meeting Action: Accept in Part
Revise proposal as follows:

3.3.31* Noncombustible Material. A substance that will not ignite and burn when subjected to a fire. [220, 2006] A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion or release flammable vapors, when subjected to a fire or heat. Materials that are reported as passing ASTM E 136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C, shall be considered noncombustible materials

A 3.3.31 Other Equivalent Standards include:

- DIN 4102
- EN 13501-1
- BS 476 Part 4
- EN ISO 1182

Committee Statement: Agreed with definition but added equivalent international standards to the annex.

Number Eligible to Vote: 19
Ballot Results: Affirmative: 16
Ballot Not Returned: 3 Daecher, C., Lichtenwald, R., Rohena, J.
1 motion.

2 I just want to point out that these are not
cables that are exposed in the tunnel, but they are
in the controls of the tunnel. So they should comply
with the same kind of concerns. And the primary
concern is low smoke and low flame spread and low
heat release. These are not cables that are inside
the tunnel itself for the motorists to be exposed to.
Thank you.

CHAIR FARR: Any further discussion on
Motion 502-7 from the floor? Mr. Connell, further
comments?

MR. CONNELL: None, Mr. Chair.

CHAIR FARR: Seeing no further discussion,
before we vote, let me restate the motion. The
motion on the floor is to accept Comment 502-36. All
those in favor of the motion, please indicate by
raising your hand. Those opposed please indicate by
raising your hand. Motion fails. We will now move
to Motion 502-8. Microphone 5, please.

MR. HIRSCHLER: Marcelo Hirschler, GBH
International, for American Fire Safety Council. I
move to accept Comment 502-45.

CHAIR FARR: Thank you. There's a motion to
accept Comment 502-45. Is there a second? Thank
you. Please proceed with the discussion.

MR. HIRSCHLER: This is doing what the Chairman says the Committee already did but didn't do. This is recognizing that there are three other international standards that can be used for determining noncombustibility.

So if the Chairman is right, that that's what the Committee wanted to do and didn't do, then he should support this motion. All this does is add as an annex note to the definition of noncombustible materials the other standards. Thank you.

CHAIR FARR: Thank you. Mr. Connell, would you like to offer the Committee's position?

MR. CONNELL: Yes, Mr. Chair. The Committee accepted ROC Proposal 502.5 in part, but decided to omit this test standard as the Committee has not had the opportunity to become familiar with the new ASTM E-2652, but notes that the current wording of the clause A-3.3.31 allows the use of equivalent standards.

As such the Committee felt more comfortable deferring the inclusion of ASTM E-2652 into the annex clause A-3.3.31. So our next cycle will allow adequate time to better understand its applicability.

CHAIR FARR: Thank you, Mr. Connell. With
that, we will open up the debate on the motion.

Please provide your name and affiliation and whether you are speaking in support of or against the motion.

Microphone 5, please.


ASTM E-2652 is identical to ISO 1182.

We have a letter from the secretary general ISO accepting ASTM's permission to reproduce ISO 1182 except for the boilerplate and write it up so that it can be used in U.S. codes and standards. We have a letter from Jim Thomas, the president of ASTM, accepting that the Committee E-5 develop ASTM E-2652.

E-2652 passed through the verbal processes of ASTM. It is a standard that is identical to ISO 1182.

And let me point out one more thing.

Although the Committee accepted in part the standard, they rejected everything that was in the comment. So I urge the members to accept the comment. Thank you.

CHAIR FARR: Thank you. Further discussion, Mr. Connell?

MR. CONNELL: Just again I think in the case of this particular proposal, simply the Committee does not doubt the identical information or
requirements within E-2652. The only concern that we have is we had not had the opportunity to have seen that. It is, in fact, a new standard and was simply deferring us for re-review in our next cycle.

CHAIR FARR: Thank you. Further discussion on the Motion 502-8 to accept Comment 502-45? Seeing none, we will move to the vote.

Before we vote, let me restate the motion on the floor. The motion on the floor is to accept Comment 502-45. All those in favor of the motion, please indicate by raising your hand. Those opposed, same sign. Motion carries. Any further discussion?

MR. CONNELL: No, Mr. Chair.

CHAIR FARR: Mr. Connell, thank you very much for your time.

Before we begin the next document, I would like to introduce Carey Bell, member of the Standards Council, who will be the presiding officer over NFPA 505 and NFPA 70. Thank you.

CHAIR BELL: Thank you very much, Ron. And good morning, ladies and gentlemen.

The next document, NFPA 505, appeared on our agenda. However, no one has signed in to make a certified amending motion on this document.

Therefore, in accordance with NFPA regulations, the
Item 10-8-13
ASSOCIATION AMENDMENT
BALLOT RESULTS

AMENDMENT

DATE: July 8, 2010

Document: NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids

Motion: To Return Entire Report

TC FINAL Ballot Results

According to 4.7.1 in the NFPA Regs (RGCP), the final results show this Amendment HAS NOT achieved the necessary 2/3 majority vote needed to recommend approval of the Association Action by the Technical Committee.

The number of affirmative votes needed for the report to be published is 18.

\[29 \text{ (eligible to vote)} - 2 \text{ (not returned)} - 0 \text{ (abstentions)} = 27 \times 0.66 = 17.82\]

In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required.

\[29 \text{ eligible} \div 2 = 14.5 = 15 \text{ (this is the simple majority)}\]

29 Eligible to Vote
2 Not Returned (DiLucido, Floyd)

9 Agree (Chastin, Cholin, Hart, Orborn, Sutton w/comment)
18 Do Not Agree (Beattie, Ebadat, Febo, Frank, Garzia, Going, Greeson, Guaricci, Holcomb, Jennett, Kirby, Navas, Roberts, Runyon, Scherpa, Schwab, Stevenson, Ural)

0 Abstention

Final Action: FAILED
NEPA 654
TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

NOTE: This Association Amendment ("Amendment") is being submitted for a ballot of the Technical Committee pursuant to section 4.7.2 of the Regulations Governing Committee Projects ("RGP"). According to the RGP, whether the results of this ballot agree or disagree with the Amendment, the default recommendation to the Standards Council will be to return to the previously adopted Document. While the Standards Council generally defers to the default recommendation prescribed by the RGP, that recommendation is not binding, and in the event of an appeal to the Standards Council, the Technical Committee ballot results will be reviewed and considered by the Council as part of its deliberations. Under NEPA rules, it is important for you to vote so the Council can take your vote into consideration during deliberations.

☐ Agree

If you agree with this amendment, the result will be to return the entire report to the committee, which means the current edition stands and the new edition is not issued.

☒ Do Not Agree*

If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain".

PLEASE SEE ATTACHED SHEET

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeane Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: WALTER S. BEATTIE

Date: June 29, 2010

June 2010
Walter S. Beattie  
Reasons for voting “Do Not Agree”

I do not agree with the motion to return the entire report.

The proposed standard provides significant improvements over the existing standard. Unfortunately, NFPA 654 is in the limelight as result of several catastrophic dust explosions over the past several years. It is unfortunate that the circumstances behind some of those incidents are from conditions outside of those permitted by either the existing or the proposed NFPA 654 standards. It is also unfortunate that many who create, or handle dust, either as a product, or a byproduct are looking for a document that is easily applied and very prescriptive. Unfortunately, handling the multitude of dust created and used in industry today is not a simple task.

NFPA works very hard to ensure that special interests will not overcome, or create undue influence, on the committee standards process. NFPA 654 is being closely monitored by many groups to see how it will impact and affect their businesses or operations. This includes those who manufacture, those who represent worker safety, and those who enforce the laws of our land. There are many who are vocal about the standard, and sometimes, while they are the loudest, they do not necessarily reflect the majority.

The proposed NFPA 654 document has included formulas which are based on methodology which has been accepted for many years. The committee is trying to incorporate this methodology and these formulas into the new NFPA 654 standard. I question the criticism that the equations are too difficult to use. I believe that there would be a learning curve in using any new equation or method; but this will be a relatively brief learning curve. In addition, there are two sets of equations in the proposed standard. One set of equations are more simply applied when the more detailed analysis is not needed or desired.

A criticism of the existing NFPA 654 document was that the 1/32 inch depth player criteria was too restrictive. The proposed NFPA 654 provides an alternative to the depth prescriptive method. The existing depth criteria provides a one-size-fits-all methodology, but the formula method provides an alternative that compensates for lesser energy dust accumulations.

Throughout the history of the NFPA standards, there has been improvement with each subsequent edition. NFPA 654 is also looking at improvement, and will continue to improve with each subsequent addition as years progress, and this research advances. While proposed section 6.1 may not be perfect, it is a base point.

One related to definitions used in the proposed standard. In particular, the term deflagration was taken into issue. I do not feel that the entire proposed standard should be returned to committee in its entirety for a word or two. The effectiveness of the proposed standard does not hinge upon the use of a single word.
Walter S. Beattie
Reasons for voting “Do Not Agree”

I do not agree with the motion to return the entire report.

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Throughout the history of the NFPA standards, there has been improvement with each subsequent edition. NFPA 654 is also looking at improvement, and will continue to improve with each subsequent addition as years progress, and this research advances. While proposed section 6.1 may not be perfect, it is a base point.

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NFPA 654
TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

NOTE: This Association Amendment ("Amendment") is being submitted for a ballot of the Technical Committee pursuant to section 4.7.2 of the Regulations Governing Committee Projects ("Regs"). According to the Regs., whether the results of this ballot agree or disagree with the Amendment, the default recommendation to the Standards Council will be to return to the previously adopted Document. While the Standards Council generally defers to the default recommendation prescribed by the Regs., that recommendation is not binding, and in the event of an appeal to the Standards Council, the Technical Committee ballot results will be reviewed and considered by the Council as part of its deliberations. Under NFPA rules, it is important for you to vote so the Council can take your vote into consideration during deliberations.

☐ Agree

If you agree with this amendment, the result will be to return the entire report to the committee, which means the current edition stands and the new edition is not issued.

☒ Do Not Agree*

If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":

Some important issues are more clearly discussed in the new edition.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169

Fax: (617) 936-7110

Signature:

Date: 6/28/2010

Name - Please Print: VAHIO GRAHAT

June 2010

Standards Council Supplemental Agenda August 3-5, 2010 Page 978 of 1603

Revised Page Number 209 of 837
NFPA 654
TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

NOTE: This Association Amendment ("Amendment") is being submitted for a ballot of the Technical Committee pursuant to section 4.7.2 of the Regulations Governing Committee Projects ("Regs"). According to the Regs, whether the results of this ballot agree or disagree with the Amendment, the default recommendation to the Standards Council will be to return to the previously adopted Document. While the Standards Council generally defers to the default recommendation prescribed by the Regs, that recommendation is not binding, and in the event of an appeal to the Standards Council, the Technical Committee ballot results will be reviewed and considered by the Council as part of its deliberations. Under NFPA rules, it is important for you to vote so the Council can take your vote into consideration during deliberations.

☐ Agree

If you agree with this amendment, the result will be to return the entire report to the committee, which means the current edition stands and the new edition is not issued.

☒ Do Not Agree*

If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

☐ Abstain*

*Please give reasons for voting “Do Not Agree” or “Abstain”:

See attached memo

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name -Please Print: Henry Febo

Date: June 29, 2010

June 2010
NFPA 654
TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Statement in support of NOT returning the report

I disagree with the association decision to return the entire report to committee. As with any document from an NFPA committee there are parts that are not perfect. If the committee waited for perfection or attempted to satisfy all interests, there would be no NFPA standards.

Specifically on the proposal 654-3 which removed a key part of the document, paragraph 6.1, leaving the document without key hazard reduction guidance, I believe the membership was skillfully maneuvered down a slippery slope while ignoring the solid ground of the technical arguments.

As I understand the debate from reading the transcript (I was not in attendance) there were a number of half truths made regarding the facts of the equations and their use. While the proposed equations are not perfect, if used properly they will not result in a facility having a greater hazard than in using the current thickness criteria alone. These imperfections do not justify postponing the larger improvements in 654 as a whole.

Two examples of this misdirection:

The equations based on mass are impractical when in fact, this same mass-based method is being used by a major paper company to conform it’s housekeeping with the regulation and the technique has been accepted by OSHA as a suitable alternative to the thickness criteria.

The equations are based on invalid assumptions when a test using the NFPA 68 partial volume explosion technique (as represented in FM Global DustCalc software) showed that for selected cases they provide equivalent dust mass value limits as the thickness criteria in the current 654.

I therefore vote against returning the document to committee on the basis that the association vote on 654-3 is first disallowed.
Standards Council Supplemental Agenda

NFPA 654
TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

NOTE: This Association Amendment ("Amendment") is being submitted for a ballot of the Technical Committee pursuant to section 4.7.2 of the Regulations Governing Committee Projects ("Regz"). According to the Regz, whether the results of this ballot agree or disagree with the Amendment, the default recommendation to the Standards Council will be to return to the previously adopted Document. While the Standards Council generally defers to the default recommendation prescribed by the Regz, that recommendation is not binding, and in the event of an appeal to the Standards Council, the Technical Committee ballot results will be reviewed and considered by the Council as part of its deliberations. Under NFPA rules, it is important for you to vote so the Council can take your vote into consideration during deliberations.

☐ Agree

If you agree with this amendment, the result will be to return the entire report to the committee, which means the current edition stands and the new edition is not issued.

☒ Do Not Agree*

If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":

See attached PDF file.

I also cite my responses to the interim draft documented on pages 46 through 98 of the transcript from the NFPA technical meeting on 6-9-10.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: L.A. Frank

Date: 6-29-10

June 2010
I am voting “Do Not Agree” for the reasons described below.

As I previously shared with the Technical Committee (TC), I am deeply saddened and frustrated by the actions taken at the Technical Meeting in Las Vegas. While I am sure we could further improve 654, I still believe that the TC has made major improvements in the document. I am proud enough of our work to believe that workers and companies would be better protected if our version of 654 were released. Regrettably, that release may now be delayed. I am gravely concerned that needless fatalities will result as a consequence of such a delay. That is an overarching reason for my “Do Not Agree” vote.

I want to be clear that I support the NITMAM process. It provides a valuable mechanism for those having divergent opinions to get their message heard. I was, however, quite surprised and dismayed by how the process was implemented at the NFPA Technical Meeting in Las Vegas. I do not feel that our product – which the TC labored over for two years – received a balanced hearing, based upon a sound, factual analysis. Bluntly put, facts did not seem to matter in the debate or in the decisions at the Technical Meeting. More bluntly, incessant repetition of incorrect or unsubstantiated statements and orotund hyperbole trumped fact and reality far too often.

I am using this substantiation statement to address some of the points raised against the draft NFPA 654 standard at the Technical Meeting and to reiterate the responses provided by those TC members who were present to speak in defense of the standard draft. It is my hope that others will add similar comments in the substantiations submitted with their ballots.

Three motions were voted on at the Technical Meeting and each was passed. While only the third motion, to return the entire standard to the TC, is the subject of this ballot, I also address some of the issues raised in the first two motions, as they served as predicates for the final motion.

1) Use of the term “deflagration” and “dust flash fire”: The TC voted overwhelmingly in support of the usage that we settled upon for these terms. Those speaking against the 654 draft contended that our use of the terms “deflagration” and “dust flash fire” were inconsistent with standard NFPA usage and that “deflagration” should be used in place of “dust flash fire.”

NFPA 68 (Standard on Explosion Protection by Deflagration Venting, the document which “owns” the term “deflagration”) defines a deflagration as:

“Propagation of a combustion zone at a velocity that is less than the speed of sound in the unreacted medium.”

This definition is consistent with the usage in the SFPE Handbook of Fire Protection Engineering, the NFPA Fire Protection Handbook, and other industry publications such as those of the American Institute of Chemical Engineers, Center for Chemical Process Safety. NFPA 1, Fire Code refers to the NFPA 68 definition. The TC believes that our
usage of the term "deflagration" is consistent with its usage in NFPA 68, and these other NFPA and industry references.

NFPA 654 must address three types of combustion hazards: fires in settled layers of dust; flash fires in suspended dust clouds; and explosions that can result when such burning dust clouds are confined in a way that allows pressure to build up. All three of these combustion events are deflagrations, consistent with the use of the term as defined by NFPA. Consequently, the TC elected to use the term "deflagration" as a more generic term to address the entire class of combustion events, while using more specific terms to focus on the different modes of combustion, and to more effectively communicate the severity of the consequences associated with the particular events.

Of particular importance in the revised standard was the need to draw the distinction between:

1. Situations involving rapidly burning and expanding combustible dust clouds where the consequence of concern is that personnel can be engulfed in, and injured by, thermal exposures from the resulting fireball, and

2. Situations where such burning dust clouds are confined in a way that pressure can build to levels that can damage enclosures, including rooms, and personnel can be injured by the physical damage that results when the enclosure bursts.

The TC, consistent with normal usage of the terms, elected to refer to the first event as a "dust flash fire" and the second as an "explosion."

The Motioner contended that the term "dust flash fire" did not adequately communicate the gravity of the event and proposed that the term "deflagration" should be used instead. To do so, in the opinion of the TC, would risk confusion between the two phenomena: dust flash fires (which the Motioner wants to call "deflagrations") and explosions (which are also deflagrations). Contrary to the Motioner’s contention, the TC actually felt that the term "dust flash fire" was more evocative of the nature, and the acute severity of the potential consequences, of the event than the more general (and more dally "scientific") term of "deflagration."

Note that the NFPA 68 Committee also thought most people did not appreciate the severity of the term deflagration. That is why the title of NFPA 68 was changed to include the word "explosion" in the 2007 edition. In other words, the Committee qualified the phrase "Venting of Deflagrations" in the title by changing it to "Explosion Protection by Deflagration Venting" in the 2007 edition.

All of the above was communicated during the Technical Meeting, along with the fact that the TC overwhelmingly believed that "dust flash fire" was the better, and more communicative, term to use to imbue the distinction between the two events (fireballs and overpressure events) in the minds of the users of the standard.
The Motioner also contended that the term “dust flash fire” was not in common usage within NFPA publications. As communicated during the Technical Meeting, there is adequate precedent within NFPA publications for the use of the term “dust flash fire.”

- NFPA 921 defines “flash fire” to include dust as a fuel.
- NFPA 2112 and 2113 use the NFPA 921 definition of “flash fire” – and the scope statements of the documents specifically refer to “dust flash fires.”
- NFPA 1951 uses the NFPA 921 definition of “flash fire.”
- NFPA 1991 refers to “dust or particulate flash fires.”
- NFPA 484 makes the distinction between the hazards associated with flash fires and explosions involving dust.
- NFPA 704 discusses flash fires from burning dust clouds.

In summary, the TC – through its overwhelming support of the proposed terminology – did not believe that the alternate use of terminology proposed by the Motioner was consistent with general usage of the terms, within and beyond NFPA publications, and did not adequately communicate the gravity of the events sought to be described.

2) Technical basis for the paragraph 6.1 equations: A common complaint was that there was no technical substantiation for the equations in paragraph 6.1. It was repeatedly pointed out by NFPA 654 supporters during the Technical Meeting debate that this assertion was not factually accurate.

For example, supporters of the 654 draft pointed out that the explosion equations were based upon the partial volume venting methodology upon which NFPA 68 is based. Every time this was explained, someone else in the opposition stood up and repeated “There is no technical basis for the equations.” I even pointed out that a vote against our equations would imply that the technology underlying NFPA 68 was not valid.

As to the flash fire equations, it was repeatedly pointed out by the supporters of the NFPA 654 draft that the flash fire equations are derived directly from the laws of thermodynamics and the ideal gas law. Certainly, the technical validity of these laws should not be in dispute at this time.

The Committee believes that the technical bases for the equations are adequately addressed in Annexes A and D of NFPA 654, and in NFPA 68. Their usage and bases were documented in the NFPA 654 ROC report. Furthermore, these equations have been subject to public review via other mechanisms, such as a technical paper presented at the 2010 Loss Prevention Symposium of the American Institute of Chemical Engineers.

3) Our equations are too difficult to use: This was an oft-repeated comment; even though I pointed out that the simple equations could be applied by anyone who could calculate the floor area of a room. NFPA 654 supporters repeatedly pointed out that the simple equations were available, and that the full (more complex) equations only needed to be used when someone could not tolerate the more conservative results from the simple
equations. Each time we did so, someone else stood and just reiterated something to the effect of: "But... they're too hard." In the end, hyperbole trumped fact.

While the protestors continued to point to the existing 1/32 inch thickness criterion (in the 2006 edition of NFPA 654) as a simpler alternative to the equations, this criterion—as was pointed out during the meeting—is not straightforward and simple to use when it is applied correctly, as described in the annex to the 2006 edition of 654. Dust layer depths in excess of the thickness criterion are intended to be limited to an area of no more than 5% of the floor area (or an equivalent area of overhead surfaces). Thus, the user still has to be capable of calculating the area of the room. Furthermore, the current 654 provides no guidance on how to assess the significance of varying depths of the dust layer. The thickness criterion requires the measurement of relatively thin layers of dust, a task that is often difficult to do, particularly for areas that are remote and difficult to reach. It can also require a knowledge of the density of the dust layer—again, a difficult to obtain parameter.

Experience has shown that both facility operators and regulators have interpreted and applied the existing thickness criterion in a variety of incorrect fashions.

In addition, it is not the thickness of the dust layer but, rather, the mass of the dust present that determines the damage potential of the dust accumulation. It is the TC’s belief that the existing dust layer thickness criterion provides a poor means of monitoring the mass of dust present in the facility and projecting its injury/damage potential.

It was suggested by the protestors that it would be necessary to remove dust from the facility and weigh it to demonstrate compliance with the mass-based equations. Well, in reality, dust accumulations do need to be removed from the facility on a periodic basis anyway—this is called “housekeeping,” and serves to ensure that dangerous amounts of dust are not present in the facility. Since the dust must be removed periodically anyway, what is wrong with weighing the dust removed and using this information to establish dust accumulation rates and required cleaning frequencies? It is far easier to vacuum dust from elevated surfaces than it is to measure the thickness of the dust on such surfaces... and more conducive to enhancing the safety of the facility.

One TC member is establishing a company-wide program to do this, and is doing so successfully. He is demonstrating the workability of the concepts embodied in, and required to implement, the mass-control-based approach underlying the equations in the draft version of 654. Furthermore, this effort is an off-shoot of a settlement agreement in which OSHA agreed with the concept. It is my understanding that the TC member will include a description of his approach, and successes, in the substantiation filed with his ballot.

Finally, and to reiterate, it is my belief that a preference for the existing thickness criterion is too often based upon a failure to understand how to correctly apply this criterion.
4) Our equations treat all dusts alike: I cannot remember a statement that was more patently false, or more readily accepted by the voting members. Even though the NFPA 654 supporters pointed out that the existing 1/32 inch depth layer criterion (apart from the density adjustment), treats all dusts alike, we were repeatedly met with claims that the equation approach was unique in being a “one-size-fits-all” methodology that did not account for heat of combustion and other dust-specific parameters. I pointed out that the 1/32 inch criterion similarly did not account for dust-specific parameters and that the only equations that did were the more complex, alternative equations provided in the 654 draft.

To be clear – the existing dust layer depth criterion is a “one-size-fits-all” methodology. Only the new, equation-based approach provides the option to reflect the actual characteristics of the dusts and the strength of the building when determining how much dust is required to exceed the thresholds for facility damage and personnel harm.

The protesters were absolutely incorrect in asserting to the membership that the equations are the “one-size-fits-all” alternative. Anyone who truly understood the equations would understand this point. Unfortunately, it appears that some of those who were denigrating the equations were apparently not seeking to first understand them.

5) No standardized method exists for estimating the entrainment fraction: Many protested the assumed value of 0.25 for the entrainment fraction used in the dust mass threshold equations and the fact that there currently is no standardized method for estimating it. The assertion was, commonly, that the equations are invalid without firm, final guidance for determining an appropriate entrainment fraction.

It is agreed that the work remains to provide better guidance for estimating entrainment fractions, and a research project is underway at this time to provide the foundation for this. The TC elected to propose a value of 0.25 until more quantitative guidance is available.

As pointed out in the Technical Meeting, the existing 1/32 inch thickness criterion inherently includes an implicit consideration of entrainment fraction. Annex D of the 2006 edition points out that not all dust is likely to be suspended into the cloud. Further, calculations have shown that, for credible situations, untenable overpressures and fireball volumes could be attained if the entire 1/32 in thick layer (over 5% of the floor area) was suspended into the burning dust cloud.

In other words, the current criterion – which the protesters fervently sought to retain – only yield tolerable results if it is assumed (as discussed in Annex D) that only a fraction of the dust is likely to be entrained.

Clearly, the entrainment fraction must be between 0.0 and 1.0, and historical records of explosions would indicate that it is not likely to be near to either of the endpoint values of the range. The 0.25 default value was selected by the TC to yield results from the explosion overpressure calculation that would match what would have been obtained.
using the existing 1/32 inch thickness criterion, for some typical values of the other variables in the equation. It was the TC’s judgment that the 0.25 value provided appropriate conservatism for the interim until a better methodology for estimating the entrainment fraction can be produced.

In conclusion, the equation approach prompts the explicit consideration of entrainment fraction—a physical reality that is obscured by the existing 1/32 inch thickness criterion. The approach contained in the revised NFPA 654 makes obvious the role of the entrainment fraction in the results of the calculations. It provides the basis for a more rigorous treatment of the topic as ongoing research yields a more quantitative basis for selecting the entrainment factor.

It is anticipated that other TC members will provide additional detail on this point in the substantiation of their ballots.

6) The existing 1/32 inch thickness criterion addresses all needed situations: The protesters repeatedly indicated, either explicitly or implicitly, that the 1/32 inch thickness criterion comprehensively addressed the needs for determining where dust fire and explosion hazards exist. In reality, the scope of application for this criterion in the 2006 edition of NFPA 654 is far more limited than the protesters seem to believe. Paragraph 6.2.3.1 of the 2006 edition of NFPA 654 limits the application of the criterion to determining the extent of the fire or dust explosion hazardous area specifically when separation is used to limit this area:

“...When separation is used to limit the fire or dust explosion hazardous area, the hazardous area shall include areas where dust accumulations exceed 1/32 in. (0.8 mm) or areas where dust clouds of a hazardous concentration exist...”

Thus, the protesters’ intent to use the criterion in a general fashion (for example, where safety is based upon segregation or detachment) is not a use that is authorized by the current edition of 654. Further, as recent work has shown, a single criterion to define both fire (dust flash fire) and overpressure (explosion) hazard areas is not feasible or appropriate.

7) There is no basis for the 0.05 fireball exposure probability in the dust flash fire equations: The equations for determining the dust flash fire mass threshold assume that 5% of the room (up to a height of 2 meters) would be filled by the fireball resulting from the entrainment of the dust (after applying the entrainment factor). The protesters questioned the validity of this assumption by the TC.

The 2006 edition of NFPA 654 contains a life safety objective to “protect occupants not in the immediate proximity of the ignition from the effects of fire, deflagration, and explosion...” (emphasis added). However, NFPA 654 has not previously addressed what “in the immediate proximity of the ignition” means. The 0.05 factor in the flash fire equations in 6.1 defines a fraction (5%) of the room volume (from floor level up to an elevation of 2 m) that might be filled with the fireball from the flash fire.
In effect, the 0.05 factor provides a quantitative perspective on what in the immediate proximity means. If the user feels the 0.05 factor is not sufficiently conservative, the results of the calculation can be proportioned downwards as the user sees fit. Annex A describes the significance of the 0.05 factor.

The TC did not feel that a value higher than 5% was appropriate.

8) Equations do not define hazard areas within equipment: In identifying the gaps in the section 6.1 equations, and in touting the benefits of the existing thickness criterion, protestors asserted that the equations only apply to building volumes and do not identify where hazards exist inside of equipment. Granted – they were not intended to do so. Neither, however, was the existing thickness criterion intended to do so. It, too, only addresses the identification of hazard areas inside building volumes. This was pointed out, and ignored, during the debate in the Technical Meeting.

The TC believes that the identification of hazardous conditions within equipment, for example, is already adequately addressed by the standard.

9) There is no loss history to justify making the standard more stringent: This is, perhaps, the most distressing assertion coming from the Technical Meeting. Expressed another way, it could be stated that “the body count tally is not high enough yet to warrant providing more stringent requirements for the control of dust in the work environment.”

There is clearly an industry loss history that illustrates the severity of the dust fire/explosion issue in the US:

- The US Chemical Safety and Hazard Investigation Board (CSB) identified 281 combustible dust incidents between 1980 and 2005 that killed 119 workers and injured 718 others
- OSHA identified 422 dust explosions between 1980 to 2008
- Significant incidents where inadequate housekeeping contributed to the severity of the incident include: Imperial Sugar, West Pharmaceuticals, CTA Acoustics, Hayes Lemmerz, Rouse Polymericns, Jahn Foundry, Malden Mills, and Ford River Rouge
- Since the forest product industry led the fight to return NFPA 654 to the TC, it is worth noting that over 7% of the dust explosion losses reported by FM Global in data sheet 7-76 involved paper dust. (Nearly 39% of the losses were associated with the woodworking industry, but that falls under the scope of NFPA 664).

As to the assertion made by several protestors that no facility in compliance with NFPA 654 has had a dust explosion, I suggest that this is the sort of statement that can be made with the greatest confidence that it can never be proven right or wrong – it just sounds good to whomever makes it, and to whomever accepts it without critical analysis.
I, personally, have never been in a dust-handling facility that complied with the existing requirements of NFPA 654 (with the possible exception of a few pharmaceutical facilities). Unfortunately, there is no roster maintained of which facilities do, or do not, comply with the housekeeping requirements in NFPA 654. However, the data coming out of the OSHA national emphasis program (NEP) for dust hazards indicate that poor housekeeping (i.e., excessive dust accumulations) is a common problem in dust handling facilities.

The TC believes that providing a more definitive means for determining "how dirty is too dirty" will assist both facility personnel and regulators in ensuring cleaner, safer facility operations.

Catastrophic dust fires and explosions are, fortunately, relative rare... but, unfortunately, they impose tragic human and business costs when they do occur. It is likely that the CSB and OSHA statistics cited above far underestimate the frequency of dust fires or explosions which, perhaps due more to luck than skill, failed to propagate to catastrophic, and media-attention garnering, proportions.

The assertion that no facility in compliance with NFPA 654 has had a dust explosion could just as easily, and just as inappropriately, be used to justify loosening the requirements in NFPA 654 to allow even greater dust accumulations, so long as the conceptual threshold body count criterion is not exceeded.

10) Other issues/concerns coming out of the Technical Meeting: There were a number of issues described in other NITMAMs that were not addressed in the Technical Meeting. These matters, addressing other technical content in the draft standard, were unrelated to the issue of the mass threshold equations.

When the protesters saw that they were going to achieve their primary objective — preventing the NFPA 654 draft from moving forward — these other issues were dropped. As a consequence, if the standard is returned to the TC, we will not have received the benefit of having seen these other issues addressed, and hopefully resolved, during the Technical Meeting.

However, these issues will remain as potential stumbling blocks that can be thrown in the path of the TC the next time we return a version of the standard to the Technical Meeting. This "Bring me another rock, as long as it is a different rock" approach will not help the TC in its efforts to produce a document which fosters improved safety in dust-handling facilities.

W. L. Frank
TC Chair
NFPA 654
TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

NOTE: This Association Amendment ("Amendment") is being submitted for a ballot of the Technical Committee pursuant to section 4.7.2 of the Regulations Governing Committee Projects ("Regs"). According to the Regs, whether the results of this ballot agree or disagree with the Amendment, the default recommendation to the Standards Council will be to return to the previously adopted Document. While the Standards Council generally defers to the default recommendation prescribed by the Regs, that recommendation is not binding, and in the event of an appeal to the Standards Council, the Technical Committee ballot results will be reviewed and considered by the Council as part of its deliberations. Under NFPA rules, it is important for you to vote so the Council can take your vote into consideration during deliberations.

☐ Agree

☐ Do Not Agree* If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":

The report in its current form provides the best consensus standard for the handling of combustible particulate solids. Much discussion, debate and peer review took place during the creation of the section related to the methodology in determining acceptable dust loading thresholds and the equations were developed using currently accepted calculations from the current NFPA 68 standard and the ideal gas law.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: HENRY W. GARZIA

Date: 7-7-10

June 2010
NFPA 654

TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases

June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

NOTE: This Association Amendment ("Amendment") is being submitted for a ballot of the Technical Committee pursuant to section 4.7.2 of the Regulations Governing Committee Projects ("Reg's"). According to the Reg's, whether the results of this ballot agree or disagree with the Amendment, the default recommendation to the Standards Council will be to return to the previously adopted Document. While the Standards Council generally defers to the default recommendation prescribed by the Reg's, that recommendation is not binding, and in the event of an appeal to the Standards Council, the Technical Committee ballot results will be reviewed and considered by the Council as part of its deliberations. Under NFPA rules, it is important for you to vote so the Council can take your vote into consideration during deliberations.

☐ Agree
   If you agree with this amendment, the result will be to return the entire report to the committee, which means the current edition stands and the new edition is not issued.

X ☐ Do Not Agree
   If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

☐ Abstain

*Please give reasons for voting "Do Not Agree" or "Abstain":  

See Attached

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature:  

Name - Please Print:  

Date:  6/29/10

June 2010
I have decided to vote against the amendment to return the entire document to the committee. My recommendation to the Standards Council is to process the report and issue the new edition. I have read the transcript from the technical meeting and am not persuaded by the arguments presented by the proponents of the NITMAM. The new edition is a product of the continuous quality improvement process and contains many valuable changes beyond and besides those highlighted by the NITMAMs. To return the standard to the committee would significantly delay the implementation of these changes that improve process safety.

Dr. John E. Stoye
NFFA 654
TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

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☐ Agree

If you agree with this amendment, the result will be to return the entire report to the committee, which means the current edition stands and the new edition is not issued.

☒ Do Not Agree*

If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain".

See attached

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: [Name - Please Print]

Date: [Date]

June 2010

Standards Council Supplemental Agenda  August 3-5, 2010

Revised Page Number 224 of 837
I do not agree with this amendment as it provides useful and repeatable means to evaluate the dust hazard at a facility. I am writing this response as an insurance industry member which does not enforce laws or necessarily need an NFPA standard to become an enforceable federal regulation. From my standpoint, the prevention of an explosion/detonation is my only goal. There are small and medium sized industries that lack the resources to evaluate (or even realize that they have an exposure) that could benefit from the committee’s revisions of NFPA 654. This standard as written provides a means of loss prevention that is both an easy but conservative means as well as a more detailed calculation method to determine the existence of a hazard.

Stephen T. Greeson, PE

NFPA 654 – TC June 2010 Association Amendment (To Return Entire Report)
NFPA 654
TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

NOTE: This Association Amendment ("Amendment") is being submitted for a ballot of the Technical Committee pursuant to section 4.7.2 of the Regulations Governing Committee Projects ("Regs"). According to the Regs, whether the results of this ballot agree or disagree with the Amendment, the default recommendation to the Standards Council will be to return to the previously adopted Document. While the Standards Council generally defers to the default recommendation prescribed by the Regs, that recommendation is not binding, and in the event of an appeal to the Standards Council, the Technical Committee ballot results will be reviewed and considered by the Council as part of its deliberations. Under NFPA rules, it is important for you to vote so the Council can take your vote into consideration during deliberations.

☐ Agree

If you agree with this amendment, the result will be to return the entire report to the committee, which means the current edition stands and the new edition is not issued.

☒ Do Not Agree

If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

☐ Abstain

*Please give reasons for voting "Do Not Agree" or "Abstain":

To much work has been done by the committee in the revised document for the entire effort to be thrown out. While errors might exist, they can be handled in other ways.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Joanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: Dan A. Guaricci

Date: 6/29/2010

June 2010
NFPA 654
TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

NOTE: This Association Amendment ("Amendment") is being submitted for a ballot of the Technical Committee pursuant to section 4.7.2 of the Regulations Governing Committee Projects ("Regps"). According to the Regps, whether the results of this ballot agree or disagree with the Amendment, the default recommendation to the Standards Council will be to return to the previously adopted Document. While the Standards Council generally defers to the default recommendation prescribed by the Regps, that recommendation is not binding, and in the event of an appeal to the Standards Council, the Technical Committee's ballot result will be reviewed and considered by the Council as part of its deliberations. Under NFPA rules, it is important for you to vote so the Council can take your vote into consideration during deliberations.

☐ Agree

If you agree with this amendment, the result will be to return the entire report to the committee, which means the current edition stands and the new edition is not issued.

☒ Do Not Agree

If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

☐ Abstain

*Please give reasons for voting "Do Not Agree" or "Abstain":

Reasons are attached to email submission.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: Mark L. Holcomb

Date: June 28, 2010

June 2010
NFPA 654 Appeal to the Standards Council
Mark L. Holcomb, MS, CIH, CSP
FINAL
Amendment: Return Entire Report
Vote: Do Not Agree

Reasons for "Do Not Agree" vote:

The following comments are based on my actual experience applying both the depth based equation (6.2.3.2) in the existing NFPA 654 standard, and the new "compressive" mass based equations provided in sections 6.1.3 and 6.1.4 of the proposed standard. I have successfully applied the mass based approach is several tissue manufacturing sites. Contrary to the opinions expressed by some NFPA members at the June 2010 meeting, in my experience, the new mass based approach is far easier to apply than is the depth approach in the current standard. I have developed a comprehensive internal fugitive dust control and housekeeping standard that incorporates the mass based equations into a procedure for measuring dust accumulation rates on building overheads and determining cleaning frequency.

Importantly, there are several fundamental technical and practical problems with the NFPA 654-2006 depth based equation in section 6.2.3.2 of the 2006 standard. This approach over estimates safe dust levels for low density dusts, lacks consensus standards for determining settled bulk density, treats all dust the same regardless of the explosive dust characteristics, and does not differentiate between building explosion and flash fire risks. Further, the old equation is difficult to apply in situations where building overhead area exceeds 5% of floor area, and is likely to lead users to significantly underestimate the amount of dust accumulations when the dust layer is not uniform, or the dust density is low. For example, the old depth based equation yields dust depths of over one inch for low density dusts raising serious questions about the adequacy of protection provided by this approach. For this reason the new standard offers two alternatives for determining dust thresholds. The first approach only requires knowledge of the building dimensions but yields more restrictive results (see section 6.1.2.1 and 6.1.2.2). For that reason, the technical committee has offered an alternative approach which takes into consideration the specific explosive characteristics of the dust and building environment where the dust is present. It is my belief that it is impossible to develop a "simple" one-size fits all approach to accurately determine safe dust thresholds given the vast differences in the explosive characteristics of dust and the building environments and processes where dust is present. In summary, based on my experience and the work I have done as a member of the NFPA 654 Technical Committee, it is my belief that the new comprehensive mass-based equations in the revised standard provide the most effective and practical way to accurately determine the quantity of dust that poses a potential hazard in a specific manufacturing process.

Additionally, other changes made to sections 7 and 8 of the current standard, along with the annex materials greatly improve the guidance provided to end users on the practical aspects of developing and implementing a comprehensive combustible dust control program, all of which are essential to reducing the risk of fire and explosion posed by combustible dust.
NFPA 654 Appeal to the Standards Council
Mark L. Holcomb, MS, CIH, CSP
FINAL
My specific comments relative to section 6 of both standards follow:

a. The 2006 equation is not based on a validated model or empirical data. When I asked the NFPA in 2006 for the basis of the equation, neither a single member of the 2006 technical committee nor anyone else within NFPA could explain how the equation was derived. Rather, it was simply described as a “rule of thumb”. In contrast, the mass based equation in the proposed standard is based on the partial volume model used in NFPA 68.

b. The 2006 equation does not incorporate into the calculation the explosive characteristics of the dust. The mass based equation takes into account important dust-specific explosion characteristics, such as worst-case concentration, maximum pressure, and dust dispersion characteristics. This holistic approach links the explosive characteristics of the dust with the determination of the dust quantity that presents a potential hazard.

c. The 2006 equation relies on measurement of the bulk density of the dust. Bulk density is not an intrinsic property of a dust and can change depending on how the dust is collected and handled. There is no standard method for measuring the bulk density of dust that has accumulated on building overheads. The tapped bulk density method (ASTM D7481-09) does not account for agglomeration or densification that may occur as a dust layer accumulates over time; nor does it address changes in density that occur when transferring dust from overheads to collection containers for measurement. Further, the 2006 equation yields depths exceeding 1 inch for dusts with densities below 2 lbs/ft³. Most experts agree that combustible dust accumulations at these depths in building overheads would present a flash fire hazard and potentially a building explosion hazard.

d. The 2006 equation does not differentiate between building explosion and flash fire hazards. The mass based equations provide a basis for evaluating and protecting against both risks.

e. The 2006 equation does not require any adjustment for overhead area. Although the non-mandatory guidance provided in Annex D does discuss adjustments for overhead area, I believe it is not followed by most users because of the complexity in making this determination, especially when the building contains multiple overhead surfaces with different shapes, sizes and layout. Detailed overhead area determinations that I have conducted indicate that the default of 5% is likely to significantly underestimate the amount of surface area where dust is accumulating. This, in turn, is likely to result in underestimating the amount of dust that may be contained in the building increasing the risk of secondary explosions.
f. The 2006 equation is difficult to apply if the guidance provided in Annex D is followed. The perception that the 2006 equation is easy to use may be rooted in the fact that most users are not following the "non-mandatory" application guidance provided in Annex D. This can lead to significant underestimations of accumulated fugitive dust on building overheads, resulting in significantly higher risk of secondary explosions. Assuming default values for dust density yields extremely low estimates of safe dust levels that put a burden on the user to either measure density (again, no standard method exists) or make operational changes to achieve very small accumulations of dust.

g. It is difficult to apply the 2006 equation if the dust layer is not uniformly distributed over the building surface. Non-uniform dust layers are typical in tissue manufacturing and converting settings, and most likely in many other manufacturing settings because fugitive dust emissions from processes are typically not uniform. Conversely, compliance with the mass based equations are easily determined by simply vacuuming and weighing dust after cleaning the overheads and then comparing the measured weight of the captured dust to the calculated mass dust thresholds. Furthermore, the vacuuming and weighing approach is more accurate because it does not involve potentially erroneous estimations of building overhead area, dust layer density, or dust depth. Once vacuum cleaning methods are adopted, measuring the mass of the dust that has accumulated in a room is a simple task since the dust has already been captured.
Standards Council Supplemental Agenda  
August 3-5, 2010  
Page 1000 of 1603  

Attachment 10-8-13-a  
(FAX)  
Page 27 of 85  
P.001/001

Standards Council Supplemental Agenda

June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

NOTE: This Association Amendment ("Amendment") is being submitted for a ballot of the Technical Committee pursuant to section 4.7.2 of the Regulations Governing Committee Projects ("Regs"). According to the Regs, whether the results of this ballot agree or disagree with the Amendment, the default recommendation to the Standards Council will be to return to the previously adopted Document. While the Standards Council generally defers to the default recommendation prescribed by the Regs, that recommendation is not binding, and in the event of an appeal to the Standards Council, the Technical Committee ballot results will be reviewed and considered by the Council as part of its deliberations. Under NFPA rules, it is important for you to vote so the Council can take your vote into consideration during deliberations.

☐ Agree

If you agree with this amendment, the result will be to return the entire report to the committee, which means the current edition stands and the new edition is not issued.

☒ Do Not Agree*

If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":

I have received a new explanation of the national and even though some other language may need to be added, I now understand the purpose of the change.

Please return as soon as possible, but no later than Tuesday, June 29, 2010.

Jeanne Moreau  
National Fire Protection Association  
1 Battery March Park  
Quincy, MA 02169  
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: JERRY L. JENNET

Date: July 7, 2010

June 2010
NFPA 654
TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

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☐ Agree
   If you agree with this amendment, the result will be to return the entire report to the committee, which means the current edition stands and the new edition is not issued.

☒ Do Not Agree* If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":

CHANGE VOTE FROM ABSTAIN TO DO NOT AGREE
SEE AQ 7 FOR REASON

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature:
Name: David Kirby
Date: 7/6/2010

June 2010
July 6, 2010

Reason for Kirby changing vote from Abstain to “Do Not Agree”.

I still feel strongly that NFPA 654 should have a visual pass/fail screening for housekeeping. This could be done by replacing Fire Basic/Explosion Basic Equations with simple guidelines, such as “if one can’t see color of paint under dust deposit, “clean or proceed to main equations”. OR we could use Fire Basic/Explosion Basic Equations each supplemented by a table of accumulation mass threshold value vs accumulation depth per bulk density.

This small change would satisfy my objections to an otherwise strong standard, which I would hate to see delayed by another code cycle if the whole document is returned to the Committee.
NFPA 654
TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

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[ ] Agree  If you agree with this amendment, the result will be to return the entire report to the committee, which means the current edition stands and the new edition is not issued.

[ ] Do Not Agree* If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

[ ] Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":

SEE ATTACHED FILE

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-9110

Signature: [Signature]

Name - Please Print: GUILLERMO A. NAVAS

Date: JULY 1st, 2010

June 2010
I am voting "Do Not Agree" for the reasons described below:

Three motions were voted on at the Technical Meeting and each was passed. While only the third motion, to return the entire standard to the TC, is the subject of this ballot, I also wish to address the issues raised in the first two motions, as they may have served as a basis for the final motion.

1) Use of the terms "deflagration" and "dust flash fire": The TC voted overwhelmingly in support of the usage that we settled upon for these terms. Those speaking against the 654 draft contend that the use of the terms "deflagration" and "dust flash fire" are inconsistent with standard NFPA usage and that "deflagration" should be used in place of "dust flash fire."

NFPA 654 addresses three types of combustion hazards: fires in settled layers of dust; flash fires in suspended dust clouds; and explosions that can result when such burning dust clouds are confined in a way that allows pressure to build up. All three of these combustion events are deflagrations, consistent with the use of the term as defined by NFPA. Consequently, the TC elected to use the term "deflagration" as a more generic term to address the entire Class of combustion events, while using more specific terms to focus on the different modes of combustion, and to more effectively communicate the severity of the consequences associated with the particular events.

Of particular importance in the revised standard was the need to draw the distinction between:

1. Situations involving rapidly burning and expanding combustible dust clouds where the consequence of concern is that personnel can be engulfed in, and injured by, thermal exposures from the resulting fireball, and

2. Situations where such burning dust clouds are confined in a way that pressure can build to levels that can damage building enclosures, and personnel are injured as a result of the enclosure’s partial or total collapse.

The TC, consistent with normal usage of the terms, elected to refer to the first event as a "dust flash fire" and the second as an "explosion."

2) Technical basis for Section 6.1 equations: A common complaint was that no technical substantiation exists for the equations in section 6.1. This assertion is not factually accurate. The explosion equations are based upon the partial volume venting methodology upon which NFPA 68 is based and are derived directly from the laws of thermodynamics and the ideal gas law; certainly, neither the technical validity of these laws, nor the methodology of NFPA 68 should be questioned at this time.

3) The equations in 6.1 are too difficult to use: Supporters of the existing 1/32 inch thickness criterion (in the 2006 edition of NFPA 654) as a simpler alternative to the equations in Section 6.1, fail to recognize that this so-called "simpler criterion" is not as straightforward and simple to use when it is applied correctly (as described in the annex to the 2006 edition of 654). Dust layer depths in excess of the thickness criterion are intended to be limited to an area of no more than 5% of the floor area (or an equivalent area of overhead surfaces). Thus, the user still has to be capable of calculating the area of the room. Therefore, the criteria may only appear to be "simpler" because both facility operators and regulators have interpreted and applied the existing thickness criterion in a variety of incorrect ways.

In addition, it is not the thickness of the dust layer but, rather, the mass of the dust present that determines the damage potential of the dust accumulation. It is the TC’s belief that the existing dust layer thickness criterion provides a poor means of monitoring the mass of dust present in the facility and projecting its injury/damage potential.
NFPA 654

TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases

June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

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☐ Agree
If you agree with this amendment, the result will be to return the entire report to the committee, which means the current edition stands and the new edition is not issued.

☒ Do Not Agree*
If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":

NFPA 654 is a consensus document created by the voting members of the technical committee. If I vote against particular proposals, but the motion passes anyway, then as a committee member I accept the decision of the committee as a whole.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: Jim Roberts

Date: 6-29-10

June 2010
NFPA 654
TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

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☐ Agree

If you agree with this amendment, the result will be to return the entire report to the committee, which means the current edition stands and the new edition is not issued.

☒ Do Not Agree*

If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

☐ Abstain*

*Please give reasons for voting “Do Not Agree” or “Abstain”:


Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: __________________________

Name - Please Print: __________________________

Date: 6-29-2010

June 2010
Memo

To: NFPA Standards Council  
Date: June 29, 2010  
From: Mark L. Runyon, CSP, CFPS  
Subject: NFPA 654- Amendment: To return entire report

Dear NFPA Standards Council,

I do not agree with the amendment to return the entire report back to the NFPA 654 Committee. The NFPA 654 committee is comprised of some of the brightest minds and some of the finest consultants in the areas of combustible dusts. The committee is comprised of a number of industries that are impacted by this standard and all of the members have offered suggestions, amendments and other improvements.

We represent insurance, wood products, chemical, sulfur, grain, specialized fire protection, and highly skilled combustible dust consultants. Most members have 10-40 years of direct experience in combustible dusts. All of us have the same goal to help prevent fires and explosions (deflagrations) in US manufacturing plants. We do not always agree on every point, but we do discuss each viewpoint and vote on them.

The countless hours we have spent in committee meetings, preparation for meetings and further discussions with clients, customers and government entities are without number. They do represent our best effort to improve a document.

I believe we have drafted the best standard that we can. Government, OSHA, industry and insurance companies are counting on us to develop the best document that we can. Sending the entire report back to the committee not only delays the release of the standard, but also causes our employers extra costs to support us in our committee work.

Thank you for your consideration of my ballot.

Mark L. Runyon, CSP, CFPS  
Vice President  
NW Partnership Safety and Property Risk Consultant  
Marsh USA Inc.
NFPA 654
TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

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☐ Agree

If you agree with this amendment, the result will be to return the entire report to the committee, which means the current edition stands and the new edition is not issued.

☒ Do Not Agree*

If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":

See attached document

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

[Signature]

Thomas Scherpa
Name - Please Print:

Date: June 29, 2010

June 2010
Substantiation of “Do Not Agree” vote for NFPA 654 Amendment to return entire report

As indicated by my vote, I feel that the proposed revisions to NFPA 654 present a substantial improvement over the existing standard and I do not support returning the entire report to committee. Since the purpose of this substantiation is to assist the Standards Council in their deliberations, I would like to address several technical issues that were raised during the debate at the Association Technical Meeting.

1. The first motion raised on this standard addressed the use of the term “flash fire hazard” in place of “deflagration hazard”. This is an issue of whether to use a term that can be misunderstood by the general population (flash fire hazard) in place of a term that is poorly understood by the general population (deflagration hazard). The argument against the term “flash fire” is that there is a mistaken perception that the event is ‘over in a flash’ and therefore the hazard is trivial.

A ‘deflagration’ can produce a variety of hazards including thermal burns, direct blast wave impact, blunt trauma or lacerations from propelled objects, or crushing from structural collapse. It was the committee’s intent to differentiate between the hazard of thermal burns (flash fire hazards) and the hazards associated with overpressure (explosion hazards), which the 2006 edition of NFPA 654 does not adequately do. It is appropriate to make this distinction as different safeguards can be applied to the different hazards.

While I understand that there are some that may underestimate the severity of a ‘flash fire hazard’, I feel that it is important to be technically correct and complete with our definitions. We must rely on the context in which the terms are used (including supporting annex material) to convey the severity of the hazard and the appropriate safeguards.

2. The second motion addressed the use of the proposed mass-based equations to replace the current 1/32” layer thickness limit.

From a technical standpoint, the available mass is the parameter that is required to determine the level of hazard. To convert this mass to an ‘allowable thickness’ requires the input of a bulk density. The origin of the 1/32” criterion is based on an ‘acceptable’ allowable mass with an assumed bulk density of 75 lb/ft³. However, this assumed bulk density value is not accurate for all dusts, and there is no adopted test method to quantitatively determine the bulk density of any given dust layer. Therefore, it is more appropriate to establish a mass-based limit rather than a thickness-based limit.

It is easier to use the simplified equations and vacuum up a sample from a known area than it is to accurately determine the average thickness of a layer of varying thickness on the order of 1/32”.
While I understand the committee's intent in choosing the value of 0.25 for the entrainment coefficient, I do not think that this value is sufficiently conservative for many common situations including deposits on elevated surfaces.

3. One of the arguments in support of the motion to return the entire document to committee was that the current loss history does not justify the proposed changes. The question at hand is whether the standard (and the standard revision process) should be both proactive and reactive or only reactive. When the potential consequences include multiple fatalities, it is certainly better to be proactive. The standard revision process incorporates both proactive and reactive elements: the periodic reviews are intended to proactively drive continuous improvement in the standards, while the Tentative Interim Amendment process is intended to allow for quick changes to the standards in response to identified deficiencies (often in reaction to an incident or a near-miss). I was dismayed to see that an insufficient loss history was used as an argument against continuous improvement of the standard.

My previous two points identified technical flaws in the two motions that preceded the motion to return the entire document. Had these motions not carried, the association vote on the final motion may have been different.
NFPA 654
TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

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☐ Agree
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☑ Do Not Agree*
If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":

See attached memo

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617- 984-7110

Signature: Richard F. Schwab
Name - Please Print: R. F. Schwab
Date: 6/7/10

June 2010
Regarding NFPA Proposed Edition 2011

Amendment: To return entire Report to the Committee:

I completely disagree with Proposal.


Apparently one of the major objections to NFPA 654 is the use of the equations. This standard along with several other NFPA Standards, such as NFPA 68, are intended as Engineering Standards. This proposed standard uses very simple algebraic equations with terms that should be very clear to a competent user.

As I understand it there was considerable objection from the floor that they equations were “too hard”. I regard this objection as illustrating the lack of understanding of simple algebra and wonder what engineering degree these people acquired and where.

First of all much of this came from intensive and extensive work on the subject of dust explosions with test work done in small and large size equipment, most of it done in Germany and Switzerland under the auspices of Dr. W. Bartknecht. It was basically supported by the German and Swiss Chemical Industry much of the work being done by Ciba-Geigy. Several large books describing this test work have been published here in the US (in English) and also in Germany (In German of course) (with many complicated and difficult equations representing the data acquired) and which are far from the simplified versions developed in NFPA 654).

Much supporting work on this subject has also been done in England and of course our own Bureau of Mines (which did much test work even preceding this work) supplementing this work.

So the statement that there is no technical basis is completely false. It is quite clear that the people who made those comments are completely unaware of this work.

I also note in passing that in the past, we had a series of Nomographs in NFPA 68 requiring only a straight edge to solve. (Nomographs are the representation of equations in graphical form). We eventually managed to reduce this to algebraic formulas which allowed extrapolation and interpolations to be more easily made. With the increasing availability of computers this should present few problems.

In my view as we develop more and more Engineering Standards in the NFPA we need to insist that the readership of those standards and the ones that are supposed to apply and enforce them understand what they say.

I also note that in the development of NFPA 68 we had many concerns about the use of design equations in a Standard. In a way I am not too surprised that people who are not
used to this engineering approach will have trouble using and applying it. We seem to seeing this in NFPA 654

It seems that the Committee will have to meet face to face to review and discuss the objections raised. I did not realize there would have been that much intense opposition to this.

I am unable to comment to the extent required on all the comments submitted but anticipate doing so at the next Dust Explosion Committee meeting.
NFPA 654
TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

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☐ Agree
    If you agree with this amendment, the result will be to return the entire report to the committee, which means the current edition stands and the new edition is not issued.

☒ Do Not Agree*  If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":

[Signature]
Name - Please Print: W.J. STEVENSON
Date: 6-28-10

June 2010
June 28, 2010

NFPA 654 Ballot
Re: Amendment to Return Entire Report

I do not agree with this amendment to the Standards Council and recommend that this report be accepted and the new edition of the Standard be issued. My reasons are as follows:

1. Walt Frank's detailed letter with reasoned argument is an accurate reflection of our collective recall, aided by the transcript of the debate at the Las Vegas Technical Meeting. The arguments on both sides of the debate had all been thoroughly considered by the Technical Committee in some cases repeatedly over the past 2 years. The overwhelming vote of the TC on each and every one of the points raised by those in opposition is a matter of record. In light of the overwhelming vote of the TC, issue by issue, it seems unlikely that a different outcome could be expected were the document returned for reconsideration. Certainly any change would require a disproportionate amount of time in relation to the benefit that might be expected. For example, I am not aware of any suffering or loss that has or could occur while we debate the definitions of certain terms.

2. It is my belief that any objective review of the arguments raised during the debate cannot help but validate the work of the TC on technical merit alone. Walt Frank's summary does a good job of framing the issues both technical and emotional.

3. The new edition of 654 is quite simply a far superior document to the 2005 edition. It should not be held up for reasons that do not appear to stand up under scrutiny.

Regards,

Bill Stevenson
NFPA 654
TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

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MY VOTE IS

Do Not Agree: I do not agree with this amendment, and recommend to the Standards Council to process this report and issue the new edition.

I will start out by an examination of the statements made at the Association meeting on the NITMAM to return the entire report. According to the meeting transcripts, SAM FRANCIS, the maker of the motion, said “And by the way, I would reiterate now that no one in all of this debate has offered a single shred of evidence that the existing document has failed, so we’re not fixing a problem. Therefore, there’s no urgency in bringing the document forward. […] In fact, it’s working quite well as is so we’re losing nothing and gaining a great deal […]”

It is easy to prove Mr. Francis’ reason to send the document back wrong. In fact, there are many undisputed serious problems with the 2006 edition of NFPA 654.

A) The problems with 654-2006 have been well known to the TC members and the Combustible Dust Experts.

The ROP cycle produced 73 proposals. The TC has acted on all 73 proposals and made the new edition a much improved, much more useable, and much easily enforceable document.

Interestingly, 10 out of the 73 proposals the TC has acted upon actually aimed at either fixing the (one size fits all) 1/32” criterion, or at fixing the technical or enforcement problems identified in the dust accumulation allowance of the 2006 edition.

For example, in proposal 654-7 John Cholin aptly pointed out the shortcomings of section 3.3.8 of the 2006 edition. His persuasive points were subsequently incorporated into the Committee proposal 654-15. Cholin’s proposal 654-10 was not accepted because it failed to distinguish flash fire hazards from explosion hazards. In proposal 654-11, I attempted to bring the enforceability into the accumulation allowance. In 654-14, Sam Rodgers of Honeywell, and in 654-16, Dave Kirby of Dow offered additional material on the dust accumulation allowance. In 654-16, Brice
Chastain of Georgia Pacific, and in proposed the following new equation for the maximum allowable dust accumulation:

\[ \text{Mdmax} = (0.031 \times \text{Copt} \times 20,000 \times H) / A_{\text{dust}} \]

aptly pointing out that the 1/32” thickness allowance in the 2006 edition does not address building height. Mr. Chastain also complained that the 2006 edition does not address dust dispersibility or dust cohesiveness, and stressed this factor be included in the new edition. In 654-21, Mark Holcomb of Kimberly-Clark proposed a similar equation because he identified that the “Existing equations do not apply to combustible dusts with densities below 15 lb/ft³. Determination of bulk density can be difficult to measure for some low-density materials that agglomerate when disturbed. This method relies instead on maximum mass accumulations. The method also factors in the optimum concentration which is an important parameter for determining the hazard a specific dust presents.”

In proposal 654-20, Dr. Bob Zalosh asserted “The current requirements to limit combustible dust layer thicknesses to 0.8 mm for bulk densities of 1200 kg/m³ or greater, and to allow larger thicknesses for lighter dusts by the ratio of 75 lb/ft³ to the actual dust bulk density in lb/ft³, is difficult to implement because of highly non-uniform dust layers and difficulty in accurate measurements of layer thickness. Furthermore, it does not account for the explosibility properties of the combustible dust. The proposed revision provides a way to estimate the total allowable accumulated mass of dust based either on the maximum allowable pressure developed in an unoccupied enclosure or the maximum allowable flame volume for a deflagration or flash fire in an unoccupied area. The basis and derivation of the equations can be shown in a revised Appendix D. For now, the key assumptions are that 25% of the accumulated dust gets disperse as a dust cloud of optimal concentration, and that the allowable flame volume after accounting for expansion due to burning, is about 5% of the room volume.”

In proposal 654-73, Dr. Zalosh further asserted “The current Annex D does not account for explosibility properties of the dust material in question. The proposed revision accounts for pertinent explosibility properties and provides an explanation and derivation of the equations being proposed to replaced the current specified maximum allowable dust layer thickness in the body of NFPA 654.”

The TC took all this valuable input into consideration and condensed into proposal 654-15. Another important issue the TC has recognized in its deliberations is that the old 1/32” criterion was based on explosion hazard alone. Burn injuries were not considered. THE COMMITTEE ALREADY TOOK CARE OF THESE PROBLEMS IN THE NEW EDITION.

**B) There are Serious Practical Problems in Implementing the Dust Accumulation Criterion in the 2006 Edition.**

There is a big discrepancy between information contained in the main body and in Annex D of the 2006 edition. As a result, some inexperienced users make mistakes and create unsafe conditions in their plants. Alternatively, mal-intentioned users can abuse this discrepancy.
First of all, the mandatory text of the 2006 edition does not offer an explicit criterion for dust accumulation allowance. Instead, main body merely states in Section 6.2.3.1 “When separation is used to limit the fire or dust explosion hazardous area, the hazardous area shall include areas where dust accumulations exceed 1/32 in. (0.8 mm) or areas where dust clouds of a hazardous concentration exist […]”

The abusers of this Section are quick to assume a building would not be an explosion hazard if the thickness of the deposits on all the surfaces does not exceed 1/32”. The Committee had actually described its intent in the carefully written Annex D of 654-2006, which requires that the area of the 1/32” thick dust accumulations should not exceed the lower of the 5% of the building floor area or 1000 ft². But, some practitioners chose to turn a blind eye to the Annex.

For the new edition and new equation, the Committee has taken care of this loophole. This is why; we are facing serious resistance from the companies who don’t like to clean their plants as often as they should.

The 2006 edition also confused OSHA. In the instructions for Combustible Dust National Emphasis Program, OSHA wrote “CSHOs (aka OSHA inspectors) should observe areas of the plant for accumulations of hazardous levels of dust (for example, greater than 1/32 of an inch, which is approximately equal to the thickness of a typical paper clip). Likely areas of dust accumulations within a plant are: structural members, conduit and pipe racks, cable trays, floors, above ceiling on and around equipment (leaks around dust collectors and ductwork.)”

“The following information may be gathered during the course of the inspection: “ “The dimensions of the room as well as the areas of the dust accumulations of greater than 1/32-inch depth.” “Annex D of NFPA 654” “indicates that immediate cleaning is warranted whenever a dust layer of 1/32-inch thickness accumulates over a surface area of at least 5% of the floor area of the facility or any given room. The 5% factor should not be used if the floor area exceeds 20,000 ft², in which case a 1,000 ft² layer of dust is the upper limit. Accumulations on overhead beams, joists, ducts, the tops of equipment, and other surfaces should be included when determining the dust coverage area. Even vertical surfaces should be included if the dust is adhering to them. Rough calculations show that the available surface area of bar joists is approximately 5% of the floor area and the equivalent surface area for steel beams can be as high as 10%. The material in Annex D is an idealized approach based on certain assumptions, including uniformity of the dust layer covering the surfaces, a bulk density of 75 lb/ft³, a dust concentration of 0.35 oz/ft³, and a dust cloud height of 10 ft. Additionally, FM Data Sheet 7-76 contains a formula to determine the dust thickness that may create an explosion hazard in a room, when some of these variables differ.”

Therefore, to do his/her job right, the OSHA inspector needs to make layer thickness measurements at many floor and elevated deposit locations, sum up the total surface area where the thickness exceeds 1/32”, compare it to the 5% of the floor area, and then apply the FM formula if he deems it necessary.

One OSHA inspector said he makes measurements to estimate the areas of the "dust piles" on the floor or elevated surfaces and adds them up. Permitting thick piles covering less than 5% of the floor area was never the intention of the NFPA 654 Committee, yet the abusers of the 2006
edition can wrongly conclude that this extremely dangerous situation would be permissible. THE COMMITTEE ALREADY TOOK CARE OF THIS PROBLEM IN THE NEW EDITION.

C) The Lack of Clarity in the 2006 Edition can unnecessarily expose employees to recognized hazards that can potentially cause death or serious physical harm.

I will demonstrate this point using the Paper Recycler Company example Mr. Cholin shared with us in his substantiation. The relevant parameters Mr. Cholin provided were as follows:

- General purpose industrial building (“spec building”)
- Enclosure strength: 40 psf
- Enclosure floor area: 20,000 ft²
- Enclosure height: 32 feet
- Hazardous Material: Paper Dust
- Bulk density: 5 lb/ft³
- Pmax: 6.6 barg
- Cw: 500 g/m³

First of all, it is important to point out that Pmax = 6.6 barg quoted by Mr. Cholin is very close to the value of Pmax = 7 barg listed for ASTM Standard Reference Combustible Dusts (Pittsburgh Seam Bituminous Coal, or Lycopodium). Therefore, the argument that paper dust or a tissue dust has a super-low heat of combustion (hence lesser protection should suffice) is clearly FALSE.

Mr. Cholin is correct in that the unintentional and deliberate abusers of the 2006 edition can arrive to the conclusion that 0.48 inch thick layer of hazardous dust is safe in this example. In other words, the 2006 edition of NFPA 654 implies spilling \( \underline{1,286 \text{ (one thousand two hundred eighty six) buckets}} \) of paper dust into this general purpose industrial building will be safe.

If a prudent fire protection engineer decides to read Annex D of the 2006 edition, he would recognize that the 0.48” thickness should really be limited to the 5% of the floor area. Hence, he would conclude that the building could tolerate paper dust layers totaling up to 64 buckets.

When there is no protection available, the new edition allows accumulation of up to 50 buckets\(^1\) of paper dust on explosion criterion and up to 35 buckets of paper dust on the flash fire criterion, which are comparable to what Annex D of the 2006 edition recommends.

The argument that the new edition will put the paper industry out of business is also FALSE. If John Cholin’s client equipped his building with explosion vents, and made his workers wear flame resistant garments, then his client could continue its operation without frequent cleaning and have \( \underline{1,286 \text{ buckets}} \) or more paper dust laying around. He would be compliant with the new edition of 654.

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\(^1\) Notice how close the 50 buckets is to the 64 buckets prudent user would conclude from the 2006 edition. Dave Kirby eloquently wrote in his substantiation “Entrainment factor, another major objection in the equations, was obtained by working backwards from depth of accumulation in previous editions, and represents best opinion of the Technical Committee.”
So, the real issue before you is whether to protect the workers or not, when the plant has 1,286 buckets of hazardous material laying around.

Mr. Cholin subsequently recounted actual deflagrations his client experienced:

"Now this facility is operated by a client of mine and it actually had a deflagration in the process equipment which vented into the facility interior. The whole event was caught on videotape. There was no propagation of a deflagration fueled by the dust accumulations. I realize that one event does not constitute a trend. But this client has had two similar events at a second facility of the same size and neither of those resulted in propagation. So this client has some faith in 654-2006 but is not convinced that the limits in 654-2010 are valid."

A prudent person might draw the opposite conclusion. The Almighty has warned this client three times. The majority of the TC is supporting the new edition. So, why should this client still wait for a major catastrophe to start believing in the new edition?

D) Should the Accumulation Criterion be based on Layer Thickness or Dust Mass?

Explosions, flash fires or deflagrations do not care about how thick the dust layer is. They care about the size and temperature of the fireball that can pressurize the enclosure or burn the employees. They care about the total accumulated mass that can become airborne. This is already acknowledged implicitly in the 2006 edition. The formula given in Section 6.2.3.2 actually converts the layer thickness to layer mass per unit area using the layer bulk density in order to account for the fluffiness of the dust deposits. The problem with the 2006 edition is that layer bulk density is usually not known, or is hard to determine. The Committee took care of this problem in the new edition. The new formulas do not need bulk density, unless a user wishes to convert his/her accumulation allowance into the old layer thickness.

In practice, measuring layer mass is a lot easier and much more accurate than trying to get an average layer thickness. THE COMMITTEE ALREADY TOOK CARE OF THIS PROBLEM IN THE NEW EDITION.

E) What About the Other Parameters?

In his ROC Comment 654-20, Mr. John Cholin argued "It is not the mass of dust that poses the deflagration problem, it is the stored energy in that mass of dust which is liberated as heat during the deflagration. The stored energy is usually stipulated as the net heat of combustion. A survey of combustible dusts shows that the net heats of combustion range from 10,000 kJ/kg for some celluloses to 50,000 kJ/kg for some of the more energetic polymers, rubbers and metals. The technical committee should reduce its prescriptive criterion to an energy release per unit of area and provide the calculations to layer thickness for different materials in the annex." Instead of the 1/32" criterion, he wanted the TC to adopt the following text:

"6.1.2* Unless supported by calculations per 6.1.3 and 6.1.4, respectively, dust explosion hazard volumes and dust deflagration fire hazard areas shall be deemed to exist when total accumulated dust mass exceeds 10,000 kJ/m² multiplied by 5% of the building or room footprint."

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Apparently, this was consistent with his performance based design method he promotes as a part of the dust explosion class he teaches for NFPA.

The committee was quick to point out that Mr. Cholin’s method was physically incorrect and unnecessarily complicated. First, calculating the net heat of combustion for dust mixture deposits is no easy task. More importantly, his approach can give incorrect results because it ignores several key parameters such as specific heat of the dust, incomplete combustion, stoichiometry (aka “Copt” or the worst case dust concentration in the cloud in the Chastain equation quoted above), enclosure height, enclosure strength, and entrainment fraction. THE COMMITTEE ALREADY TOOK CARE OF THESE PROBLEMS IN THE NEW EDITION.


The old 1/32” criterion implied in the 2006 edition is actually self-contradictory. To prove this point, let’s assume, for the moment, that 1/32” criterion is perfectly accurate for a special plant that has a height of 30 ft, dust layer limited to 5% of the floor area, handling dust with Pmax = 5 bar and optimal concentration Copt = 1000 g/m3.

- If the enclosure height is reduced to 15 ft, shouldn’t the layer thickness be reduced to 1/64”?
- If a new dust is introduced which has a Pmax = 10 bar, and Copt = 1000 g/m3, shouldn’t the layer thickness be 1/64”?
- If a new dust is introduced which has a Pmax = 5 bar, and Copt = 250 g/m3 shouldn’t the layer thickness be 1/128”?
- If a new dust is introduced which has a Pmax = 10 bar, and Copt = 250 g/m3 shouldn’t the layer thickness be 1/256”?

The answers to all these questions are affirmative from the scientific perspective. Yet, the 2006 edition treats all enclosures and all dusts with the same old 1/32” criterion. Based on the above example, 1/32” criterion can not be right for all circumstances. On the other hand, new formulas incorporate governing parameters, hence THE COMMITTEE ALREADY TOOK CARE OF THESE PROBLEMS IN THE NEW EDITION.

G) Does the TC have to Point to a Particular Loss or Loss History to Improve the Document?

Mr. Cholin stated “I don’t know that anybody dealing with deflagrations and explosions can identify a loss where the event occurred in spite of conforming with our current edition of the document.” I don’t think anyone could, not because it did not happen, but because an initially 1/32” thick layer would leave no recognizable dust layer residue after a deflagration, subsequent fire, sprinkler discharge, and fire service hose streams.

Fortunately, catastrophic dust explosions are rare events. When they happen they destroy the plant and often the evidence of how they initiated and how they propagated. On the other hand, minor incidents such as small puffs, whooshes, flashes, and burps are more frequent and telltale
signs of the catastrophic hazard. Unfortunately, 2006 edition did not require investigation and documentation of these important telltale events. The new edition does.

No one in good conscience can argue that the TC should point to a Particular Loss or Loss History before it is able to fix the dangerous loopholes and contradictory safety allowances outlined in items A, B, C, F and G above.

H) Are the New Formulas Too Hard to Enforce?

Mr. Cholin, Mr. Chastain, and Mr. Francis argued that new formulas are too hard for the plant personnel and OSHA inspectors to evaluate. I could not disagree more. I find their comments disingenuous especially because the simple equations in the new document are actually simpler than the Chastain equation given in part A above, and the full equations in the new document are only slightly more involved than the Chastain equation given in part A above. Anyone who has a calculator can multiply and divide 7 numbers. In any case, they are all much much simpler than Mr. Cholin’s net heat of combustion method discussed in Part D above.

Few members seem to have a misconception that the new edition did away with the old visual pass/fail criterion in the old edition. There was never a visual pass/fail criterion in the 2006 edition. There is a mention of 1/32” being approximately equal to the paperclip wire in Annexes A and D, which also said dust layer area should be limited to 5% of the building area. But, the paperclip tool became useless when the bulk density correction was invoked. For example, paperclip may have to be replaced with a deep-dish pizza for layers that have a bulk density of 5 lb/ft3.

The new edition does not preclude the use of the layer thickness as a pass/fail criterion. It actually provides information on how to convert the allowable mass to allowable layer thickness.

Annex A of 2006 edition also makes mention of “Surface color just discernible under the dust layer,” for dust accumulations which might be considered negligible. This issue was discussed in depth in the meetings, and the TC members agreed that a visual criterion would be highly subjective, as it would depend on factors such as dust color, surface color, opacity and reflectance of dust particles, void fraction in the dust layer, and the uniformity of the layer thickness.

I) How did the Committee Arrive at the Default Value of 25% for the Entrainment Fraction?

Entrainment fraction of 25% was obtained by working backwards from depth of accumulation allowed in the 2006 edition and represents the best opinion of the TC. In other words, the committee selected the value of 25% by a consensus process, to match the old 1/32” criterion for typical applications. So, it has a basis which is equally valid to the old 1/32” criterion. Alternatively, the Committee also considered selecting an entrainment factor of 100% (instead of the 25%), because then the equations would have been indisputably conservative for all applications. In other words, no one needs to do any research or testing to show that 100% value is conservative. Those who do not like the 25% value the TC picked can achieve the indisputable
100% value by simply cleaning dust accumulations 4 times more often than the new edition requires.

All these discussions made me ponder. If the TC used the numerical value of 0.25 in the equations without calling it entrainment fraction, and without tying the equations to a physical picture, what would we be arguing about now?

J) Were There any Irregularities In the TC Meetings or at the NFPA Association Meeting?

Mr. Chastain alleged improprieties in TC teleconferences by claiming they “were very short as far as notifying the members who would be participating.” I don’t know what kind of advance notice the NFPA rules and regulations require. But as far as I know, they were set by seasoned NFPA employees. All decisions were made via letter ballots and the votes were circulated to provide ample opportunities for the TC members to influence their colleagues as needed.

On the other hand, one attendee of the Association Meeting wrote: “At the meeting, and this struck me forcefully at the time, there were 5 members of the TC present, 3 for and 2 against. To an outsider with no background it might have seemed that the TC is divided. And even though we pointed out the overwhelming vote on each issue by the TC, it is telling that so few of the members came to the meeting to defend our work.” He is absolutely right. Those of us at the meeting all failed to point out that bulk of the opposition came not from 2 committee members but from a single company. Brice Chastain is a Georgia Pacific employee, John Cholin is a Georgia Pacific consultant, Sam Francis and Stan Lancey represented American Forest and Paper Association whose first vice chair is James B. Hannan, President & CEO, Georgia-Pacific, LLC.

Furthermore, most of the paragraphs the Mr. Chastain used to substantiate his latest 654 Committee vote are verbatim reproductions Mr. Lancey’s paragraphs for his appeal.

NFPA should investigate and decide whether any of these were allowable practices or wrongdoings.


The issues disputed at the Association meeting pertain only to a small number of changes in the new edition. The new edition provides significant improvements in many areas such as Air Material Separators (Dust Collectors), Incident investigation, Use of Separation, Use of Segregation, Explosion Protection, Explosion Isolation, Pneumatic Conveying Systems, Housekeeping, Vacuum cleaners, Intermediate Bulk Containers (IBCs), Training and Procedures, Contractors and Subcontractors, and a lot of explanatory material which makes the Standard user friendly.

Returning the entire report back to the TC will delay the publication of these important improvements for a year or more. Holding back all these improvements for a year or more will...
be a great disservice to the workforce, public, and the industries that rely on NFPA to promptly disseminate, and not to hold back, accurate and up to date information.

That is why I disagree with the Association meeting vote and strongly urge the Standards Council to process this report and issue the new edition.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:
Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature:
Name - Please Print: Erdem A. Ural
Date: June 29, 2010

[Signature]
NFPA 654

TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

NOTE: This Association Amendment ("Amendment") is being submitted for a ballot of the Technical Committee pursuant to section 4.7.2 of the Regulations Governing Committee Projects ("Rega"). According to the Rega, whether the results of this ballot agree or disagree with the Amendment, the default recommendation to the Standards Council will be to return to the previously adopted Document. While the Standards Council generally defers to the default recommendation prescribed by the Rega, that recommendation is not binding, and in the event of an appeal to the Standards Council, the Technical Committee ballot results will be reviewed and considered by the Council as part of its deliberations. Under NFPA rules, it is important for you to vote so the Council can take your vote into consideration during deliberations.

☑ Agree  
If you agree with this amendment, the result will be to return the entire report to the committee, which means the current edition stands and the new edition is not issued.

☐ Do Not Agree*  
If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

☐ Abstain*  

*Please give reasons for voting "Do Not Agree" or "Abstain":

Please see attached

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Morneau  
National Fire Protection Association  
1 Batterymarch Park  
Quincy, MA 02169  
FAX: 617-984-7110

Signature: [Signature]  
Name - Please Print: [Name - Please Print]  
Date: [Date]

June 2010

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In support of the motion to return the entire NFPA 654 report back to committee I provide the following recommendations and substantiations.

Brice Chastain
29 June 2010

Recommendations: Move equations 6.1.2.1, 6.1.2.2, 6.1.3* and 6.1.4* to the Annex as examples of performance based options to establish dust mass threshold levels. Retain the “settled bulk density” methodology present in NFPA 654 (2006 Edition), Section 6.2.3.2 that also appropriately addresses dust moisture content in the “settled bulk density” method and a limit on the maximum accumulation for dust with settled bulk densities below 2 lbs/ft³ to no more than 1”.

In support of these recommendations above related to the new dust mass equations proposed and maintaining the existing settled bulk density equation in the 2011 edition of NFPA 654, the following issues associated the new proposed methodology substantiate these recommendations:

- Issues with the two simple equations and components required by and contained in the two complex equations
- Practicality or lack of practicality for the users and regulators
- And lack of loss history to support the dust allowance methods proposed.

While AF&PA has reason to believe the four equations in 6.1.2.1, 6.1.2.2, 6.1.3* and 6.1.4* may show promise (especially when the entrainment fraction methodology is validated at a future date), there is no database from field trials of the proposed methodology or evaluation of loss history data comparing the old and the new methods to show risk reduction benefits commensurate with the greater complexity and cost of the new method to industry. The method has not been studied in sufficient detail, substantiated or validated from a statistical standpoint to show it is any better at risk reduction than the current settled bulk density method. The more complex methodology has not been refined based on actual trial use in several different industries to ensure it is understandable by the manufacturing plant populations that would have to use it. There has also been no cost analysis performed with the proposed methodology as compared to the existing methodology to establish cost impact to industry, large or small.

Dust layer thickness supported by settled bulk density is a more intuitive and understandable method that can be more practically implemented to get the broadest reapplication and risk reduction benefits. Accordingly, there is no demonstrated basis for adopting these equations at this time. If the technical supporting data thought to justify these equations is later developed, another round of public comment would then be necessary to give interested parties sufficient time to consider the validity of the assertion that the data is adequate to validate the equations.

Furthermore, even if the equations were scientifically validated, there is no loss history at present that substantiates the need for new, “theoretical”, more conservative equations.
No loss history data has been presented that implies that the previous settled bulk density equations contained in NFPA 654 (2006 Edition), Section 6.2.3.2, are not appropriate and have not served industry in reducing the risk of combustible dust deflagrations and explosions.

Furthermore, even if loss history existed with the present 2006 edition equations, the value(s) of the entrainment factor(s), which is critical to the use of Section 6.1.3*, and 6.1.4* equations, has not been validated. NFPA has acknowledged that there is no technical basis for the entrainment value, ηp, in Section 6.1.5 in stating that it is a "random" number. The use of the term "random" by NFPA, was used in the official solicitation for research funds to establish a methodology. That is the stated reason for the proposed research project on this topic. NFPA has solicited funding and subsequently successfully funded a research project that would perform a study designed to assess whether an appropriate value for the entrainment factor can be determined and, if so, to determine that value (or values) for different dusts. This study has not been completed and its results shared for a broader review.

Additionally, a methodology for substantiating the value (or values) of the entrainment factor has not been developed or accepted by any recognized national standards organizations. There is currently no available data (which is the only data that may be considered) to support the use of a single entrainment factor (default value of 0.25) for all dusts. Nor is there any nationally recognized test method for quantifying the entrainment factor, ηp, for a given dust sample. Consequently, the user is unable to determine if the "default value" of 0.25 for ηp is appropriate for her/his dust situation from a risk perspective. The committee itself stated in a Committee Statement in responding to ROC Proposal Comment 654-14 that "The Committee recognizes that establishing a single value (for entrainment factor) may not cover all situations and acknowledges that research is underway to clarify this criteria." Realistically, a valid and approved methodology for determining entrainment fractions required for use of the equations for all dust types is minimally years away.

If empirically determined values are to be used and relied on, the basis for determining those values must be publicly disclosed to provide the transparency required of standards development by consensus organizations. Furthermore, given the fact that the new equations in Sections 6.1.2.1, 6.1.2.2, 6.1.3* and 6.1.4* do not take feasibility into consideration, it would be inappropriate to utilize these equations to derive a lower value for the dust mass than is calculated using the 2006 edition dust thickness based on settled bulk density equations in Section 6.2.3.2.

In addition to the lack of substantiation, the simple fire equation presented in paragraph 6.1.2.2 represents a 40% reduction in total dust mass from the previous settled bulk density equation, for example, for a material (e.g. tissue paper) with a settled bulk density of 2 lbs/ft3 (~1 kg/m3). What is the basis for such a reduction in dust allowance? Loss History does not support this reduction.
Additionally, the two “simple” equations presented in Sections 6.1.2.1 and 6.1.2.2 do not take into consideration the type of dust or the combustion energy of particular dusts from a risk perspective. It lumps all dusts (for example; powder river basin coal, polyethylene, urea-formaldehyde, phenolic resin, epoxy resin, paper, starch, etc.) into one category based on a simple but conservative 0.02 multiplication factor times the floor area to establish allowable mass. This leads one to believe that all combustible dusts (those with a Kst of 290 and those with a Kst of 20 are equal from a deflagration or explosion risk perspective which is far from accurate.

The conservative approach provided by the two simple equations penalizes facilities with less energetic, less-deflagrable dusts (e.g. paper) as opposed to more energetic, more-deflagrable dusts (powder river basin coal; some epoxide and phenolic resins; some starches, etc.) by establishing a “one size (i.e. mass) fits all “conservative” approach” based strictly on the floor area of a building or process area with no consideration of relative risks between different combustible dusts. This one-size fits all approach is not warranted for the user community that has a variety of combustible dusts many with substantially different risk profiles from a deflagration and explosion perspective.

Additionally, the two new “complex” equations in proposed Sections 6.1.3* and 6.1.4* (explosion and fire protection) are too complex for most general industry employers and the numerous facilities that do not have intellectual infrastructure in place (i.e. have only non-engineering personnel present or available). To use the more complex equations presented in paragraphs 6.1.3* and 6.1.4* each facility would need to have its dust tested for explosivity parameters to obtain Cw and Pmax data in order to use the equations. The estimated cost for such tests is $2,000 per sample.

Many small industrial facilities would be substantially burdened by the cost and the need to hire outside consultants to obtain this data, obtain laboratory test data, and apply the equations and establish the structure/building and personnel/fire dust mass thresholds. The present dust thickness equations are easily understood and applied by industry and regulators and do not present unnecessary and excessive cost burden to the user. Additionally, there is no loss history to suggest that when the 2006 edition’s settled bulk density equations are used, they did not protect industry and the public.

Practicality

Furthermore, the practicality of using these equations has not been appropriately considered, addressed and will further burden industry. After the industrial user establishes the allowable mass under any of the four new equations, the user has to determine if the area or building’s combustible dust mass has been exceeded. The only way to accurately establish if the area or building exceeds the established allowable combustible dust mass derived from the equations is to vacuum all the dust in the area or building using dust ignition proof vacuum systems including all ledges and overhead structures (beams, lights, cable trays, ductwork, pipes, etc), bag the dust, and weigh the dust. Then the user would compare the weight of the collected dust with the mass allowance determined by the new equations to determine if the allowable mass threshold
has been exceeded. This is certainly impractical for the majority of most industrial users and for industrial processes where process dust emissions are variable and thereby requiring multiple studies with vacuuming and weighing to establish an accurate dust mass allowance threshold based on process variability. It is worthwhile to note that each hour a paper machine is shut down for any reason costs the owner ~$10,000 an hour or ~$240,000 per day.

**Regulatory Issues**

These mass determination and verification methods are also impractical and unenforceable from a regulatory perspective either by Fire Marshals, Fire Inspectors, or OSHA Compliance Officers, to determine compliance or non-compliance if these four equations were adopted into an OSHA Combustible Dust Standard presently being written. The proponents of the new 6.1.2.1, 6.1.2.2, 6.1.3* and 6.1.4* equations have indicated that the user could estimate the mass in an area or building using the weight or mass of a given square meter and estimate the mass visually by mass height per unit area for the dust mass present throughout the area or building. We believe this is impractical and also a recipe for error in establishing risk and compliance/non-compliance with the mass allowances derived from the four new 2011 edition equations proposed.

Based on the fact that there is no loss history and minimal analytical costs incurred by industry to implement the 2006 Edition Section 6.2.3.2 simple settled bulk density equation for establishing acceptable dust accumulation thresholds, AF&PA members believe the dust thickness - settled bulk density equation (2006 Edition) can be used practically by all of industry and regulators to establish accumulation allowances without unacceptable risks, uncertainties, impracticalities and excessive costs. The four new equations proposed are recommended presented in the Annex material as a "performance based option" until equation components such as the "entrainment fraction" methodology can be developed, validated and approved for industry use.
NFPA 654
TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

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☐ Agree

If you agree with this amendment, the result will be to return the entire report to the committee, which means the current edition stands and the new edition is not issued.

☐ Do Not Agree*

If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":

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Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: [Name]

Date: [Date]

June 2010
Substantiation of Cholin Ballot to Return NFPA 654 to Committee

We all have the same objective – to produce a new edition of NFPA 654 that adequately addresses the hazards yet does not make operating a facility so difficult that we export more American jobs to other places. Every one involved in this effort has worked hard. We disagree only on some details. But those details are important.

I opposed the new section 6.1 on the basis that it is:
1. incomplete
2. requires the use of a computational assessment that relies upon a parameter whose numerical value we do not know,
3. requires the use of a computational assessment that relies upon a parameter for which there is no current test method for determining its numerical value, and
4. Establishes an acceptable level of employee injury that has not been determined to be acceptable to society.

We all recognized that there was a problem with the 2006 edition in that it did not clearly establish what constituted an “explosion hazard” yet relied upon the phrase “where an explosion hazard exists...” to establish requirements for protection. We have been using the language in the current 6.2.3.1 to back into the determination of where an explosion hazard exists in the building interior. But there is no explicit language in the document establishing what the TC deems constitutes an “explosion hazard”. This issue was addressed in Proposals 654-7 and 654-10. The ROP indicates that the issue was addressed by the committee by Accepting in Principal. No comment was made because the section on hazard determination was still in a state of flux during the comment period. But the new language in Section 6.1 of the proposed 2010 edition does not address anything but building compartments. So we are still in a situation where we have numerous requirements in Chapter 7 that rely upon the predicate phrase “where an explosion hazard exists” but nowhere does the standard clearly spell out what criteria one should use to determine if a vessel, duct, conveyor, bin, bunker, silo, etc. constitutes an explosion hazard. How is the user supposed to know? Does a silo with 1% deflagrable (explosible) particulate mixed in with the big stuff constitute an “explosion hazard”? How about a pneumatic conveyance duct? We can’t expect the operator to perform a PHA to identify the hazards if we do not clearly establish what the TC deems a hazard.

This is an important issue as most of the post-event litigation ultimately boils down to whether the hazard was adequately recognized. Were the requirements of the nationally recognized standard of care, NFPA 654 observed correctly? When there is ambiguity in what constitutes an explosion hazard it is easy for the lawyers to argue that the requirements of Chapter 7 are not applicable. This is a big chink of work that just got forgotten while everybody was grappling with the implications of introducing the hazard assessment relations for the building interior spaces. Unfortunately, it makes the document incomplete.

But there are still problems with those relations. This is not to say that conceptually the document isn’t headed in the right direction, it is, but we are not where we want or need to be yet.

I have a paper recycler with a 20,000 ft² (1,858 m²) facility, 32 feet floor slab to roof deck. The bulk density of the paper dust is approximately 5 lb/ft³. According to 5.2.3.1 of 654-2006 this operator is allowed a dust layer of 0.48 inches in depth. Under 654-2010, using the simple relations in 6.1.2.1 and 6.1.2.2, this operator is allowed 37 kg (82 lb) of dust in the facility for the personnel safety objective and 72 kg (159 lb) for the building structure objective. At 5 lb/ft³ this equates to a layer 0.0085 inches thick for the personnel objective and 0.019 inches thick for the structural objective! This is far less than the level permitted by the current 654. Do we have a loss history that justifies this 50-fold reduction in the permissible dust layer for personnel objective and 25-fold reduction for the structural objective?
Now this facility is operated by a client of mine and it actually had a deflagration in the process equipment which vented into the facility interior. The whole event was caught on videotape. There was no propagation of a deflagration fueled by the dust accumulations. I realize that one event does not constitute a trend. But this client has had two similar events at a second facility of the same size and neither of those resulted in propagation. So this client has some faith in 654-2008 but is not convinced that the limits in 654-2010 are valid.

So let's use 6.1.3 and 6.1.4. $P_{max} = 8.6$ bar; $C_w = 500g/m^2$. It's a long-term lease of a spec building in an industrial park so we will assume a wall strength of 40 PSF and a DLF of 1.5 (worst-case). $M_{break} = 17,583/\eta_0$ grams. But what value do we use for $\eta_0$? At Interfab (another paper recycler that had a serious explosion several years ago) there were dust accumulations of 4 to 8 inches before the event (from contractor photos) and less than 1 inch after the event (scene documentation). At my client's locations the 3 events we have investigated left the area near the vented deflagration clean — no residual dust. So I guess I shouldn't use the "default value" but assume a worst-case limit of 1.00 for $\eta_0$. For calculating the permissible dust layer for the structural objective that allows me 17.5 kg over the 1,858 m² area for a total of 34.6 grams per m². This is equivalent to .0046 inch thick layer if the layer is disturbed evenly over the entire interior. Even if I used the default value for $\eta_0 = 0.25$ we get a layer 4 times that thickness or 0.018 inches in thickness. This is far less than dust layers depths that did not produce a propagating deflagration in 3 out of 3 incidents. For the personnel safety objective, again setting $\eta_0 = 1$, I get: 244.4 kg/m² of dust permitted over the 1,858 m² area for a total of 313.5 g/m². At 5 lb/ft² this equates to 0.32 inch in depth, much closer to what I get using 654-2006. Yet this client has 3 events on videotape with dust depths greater than this number and there has been no evidence of deflagration extension into the building interior even though there appeared to be 100% dispersion. If I use $\eta_0 = 0.25$ I get a dust layer depth of 1.28 inches over the entire interior area. I cannot expect that much dust to not produce a propagating deflagration.

I understand that if the fugitive dust accumulations were limited to a fraction of the area of the facility that this computational method would allow for deeper dust layers in that fractional area. And that is a definite advantage, especially for the denser, more energetic dusts that pose a greater hazard and in process facilities where the fugitive dust layers occupy a fraction of the building. But the less dense dusts tend to migrate further and a commensurately larger portion of the facility must be used in the area calculations. If I assume that the dust in the above example only occupies 25% of the total building floor area then the dust layer thickness becomes 5 inches, equal to what blew two employees out the end of the Interfab building.

Something is wrong here. And there is NO ALTERNATIVE to using these relations in the proposed new standard.

In the current edition of the standard we have the simple, doiley measurement in 6.2.3.1 and if we don't think the result is reasonable we can correct for bulk density and net heat of combustion and get a number that is more closely correlated to the actual dust in question. We have no loss history that I can find that suggests that the simple, doiley relation is insufficiently conservative to allow for safe operations.

With the proposed new edition we have only one alternative, and that is to come up with a value for $\eta_0$ other than the default value. Minor problem – there is no test method for doing that! Until we have a method for quantifying how much dust is going to be dispersed, regardless of the mechanism, and the fraction of the dispersed material that actually participates in the combustion process we are stuck. Without this information we cannot even use Chapter 5 to develop a hazard determination criterion.

That is why there is so much opposition to these relations right now. When we plug in data for real-life situations they lead to conclusions that are unachievable or are not supported by the loss history. Furthermore, the tools facility operators need to comply with the requirements that are laid out in the proposed new standard don't yet exist.
Before we can use this computational method we must have a method to quantify how much of an accumulated layer is dispersed, regardless of the actual mechanism. We must have a method to quantify how much of the dispersed dust actually burns. We must have a method to quantify the results of the combustion. Le Chatier's principal tells us that when a chemical reaction does mechanical work it tends not to proceed to completion. Pressurizing a building and accelerating dust is mechanical work. Heating the dust up to AIT absorbs heat. In most of the event reconstructions I have done I find that the combustion process consumes the majority of the oxygen and becomes oxidant-limited. These factors all contribute to likelihood that the initial ignition will lead to a propagating deflagration.

We have not yet had the time to connect all of the dots. We have a partial computational model of what we expect to happen. Now we have to try to verify that model with event data to see if the model is a good predictor of the event. This hasn't occurred. The initial "reality-checks" I have started with my event data suggests that there are unaddressed issues that we should address before we issue this document as the nationally recognized minimum-compliance standard of care.

The TC has used a 5% probability of flame imoingement criterion in the personnel objective relations. As I remember Bob Zalosh's presentation during the RCP meeting he used 5% as an example. Was it his intent that the TC simply embrace that number as the appropriate value? Is this number acceptable to the stakeholders at the site? Is it acceptable to the workman's compensation insurance carrier, the owner and the employees? NFPA 654 should not stipulate what this acceptable loss level is — it should be left to the owner/operator and the other stakeholders in the site.

Finally, we need to keep in mind that this standard is not for us - we have been entrusted with writing it for the American public. It is supposed to be a hazard management tool that enforcement personnel, plant managers, facility engineers and consultants can use to manage the hazards encompassed by the scope statement. If we make the document too difficult to use we will make it irrelevant. OSHA is going to develop its own dust explosion hazard regulation which will permit the use of NFPA standards as a performance-equivalent alternative (I hope). We can make our document easy to use or hard to use. If it is easy to use then facility operators will use it and we have the ability to ensure that they are using methods that assure their employees and owners that the hazards are properly addressed. If we don't, then the document that gets used will be written by some one else and we loose the leadership position. I don't think there is a more competent, devoted group of people than our TC.

I also moved adoption of comment # 654-33. When the TC decided to move the requirements for return air diversion to the section on air-material separators, a good idea, it managed to loose the requirement for return air diversion and, instead, required deflagration isolation. At Rochester Shoe Tree deflagration isolation was provided on the return air duct. When the dust collector caught fire, smoke, flame and burning filter media was conveyed back into the plant setting the plant on fire, burning 5 employees and destroying the building. The deflagration isolation system, required by the proposed new edition of 654 and manufactured by a firm that is represented on the TC, never operated. That's because the deflagration isolation system relies upon pressure sensors for actuation. During a dust collector fire the needed pressure rise does not occur. Furthermore, even if it did actuate, the deflagration isolation system does not provide sufficient agent to offset the nominal 10-25 MW heat release rate of a dust collector fire. The only effective means of managing the fire hazard associated with the return of cleaned air from a dust collector is with return air diversion using abort gates. The overwhelming majority of the dust collector explosions we see start off as dust collector fires which transition to deflagration when the automatic bag cleaning feature operates. Only a fraction of the dust collector fires end up as explosions. Accepting Comment 654-33 would fix this error.
I also moved to replace the "dust flash fire" terminology with "dust deflagration" terminology. You might recollect that during the ROP meeting the TC voted to do this. The justification was that the fire protection community has an understanding of what a deflagration is and there is a benefit to remaining consistent with this terminology. However, I am told that during one of the subsequent teleconference meetings (I was teaching during the first and did not receive any advanced notice of the second) it was moved to switch it back. The membership of NFPA present at the voting agreed with using the term "deflagration" rather than "flash fire".

I realize that I have been viewed as "the bad guy". Actually, I don't like that role. I would prefer to be a participant in progress rather than accused of being the obstacle to it. But sometimes what initially seemed as progress needs to be steered in a slightly different direction if true progress is to be achieved. I offered to work on a TIA that would address the problems that exist with the proposed 2011 edition of the document but that initial offer was rejected. The offer still stands.

John M. Cholin
Amendment: Return Entire Report

NOTE: This Association Amendment ("Amendment") is being submitted for a ballot of the Technical Committee pursuant to section 4.7.2 of the Regulations Governing Committee Projects ("Regz"). According to the Regz., whether the results of this ballot agree or disagree with the Amendment, the default recommendation to the Standards Council will be to return to the previously adopted Document. While the Standards Council generally defers to the default recommendation prescribed by the Regz, that recommendation is not binding, and in the event of an appeal to the Standards Council, the Technical Committee ballot results will be reviewed and considered by the Council as part of its deliberations. Under NFPA rules, it is important for you to vote so the Council can take your vote into consideration during deliberations.

☐ Agree

If you agree with this amendment, the result will be to return the entire report to the committee, which means the current edition stands and the new edition is not issued.

☐ Do Not Agree*

If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":

See attached comments.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: Paul F. Hart

Date: 6/28/2010

June 2010
Paul Hart Comments on NFPA 654
Amendment to Return Entire Report
6/28/2010

I feel as a whole the proposed NFPA 654 contained significant improvements over the previous edition. However, in light of the comments made at the June 9th meeting, comments made via email subsequent to the meeting, pending potential rulemaking and ongoing NFPRF research, I find I agree with the amendment.

In my opinion there were two main issues that lead to the return:
1. Removal of a simple, understandable and quantifiable limit to determine if an explosion hazards exists (e.g., 1/32 inch)
2. Inclusion of new criteria to determine if an explosion hazard or a flash fire hazard exists.

A simplified method was incorporated into the proposed standard to address the 1/32 inch criteria. However, it was apparent from the comments that this criterion was still too complex. I also attended an educational presentation on the topic at the NFPA meeting at which I sensed some in the audience were having a difficult time grasping the approach.

I believe the new hazard assessment criteria is technically sound. Explanatory material is also provided in the appendix. However, it seems that even more information such as examples is needed to improve user understanding of the approach.

This was a difficult decision. However, this is a critical time for dust hazard assessment with the specter of governmental rulemaking. I feel NFPA’s process for standard development should drive industry’s dust hazard assessment process. If an additional year or two is needed to produce an even better document, then so be it. It could provide more time to educate both technical committee members and users. It would also more closely couple a current NFPRF project with the standard development cycle.

I believe given more time additional improvements can be made to the ROC version of 654 including:

- Incorporating simple, readily understood, implementable criteria for explosion hazards assessment
- Providing additional explanatory material on the basis of new approaches to explosion and flash fire hazard assessments to improve user understanding

Paul Hart
NFPA 654

TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

NOTE: This Association Amendment ("Amendment") is being submitted for a ballot of the Technical Committee pursuant to section 4.7.2 of the Regulations Governing Committee Projects ("Reg's"). According to the Reg's, whether the results of this ballot agree or disagree with the Amendment, the default recommendation to the Standards Council will be to return to the previously adopted Document. While the Standards Council generally defers to the default recommendation presented by the Reg's, that recommendation is not binding. and in the event of an appeal to the Standards Council, the Technical Committee ballot results will be reviewed and considered by the Council as part of its deliberations. Under NFPA rules, it is important for you to vote so the Council can take your vote into consideration during deliberations.

☐ Agree
If you agree with this amendment, the result will be to return the entire report to the committee, which means the current edition stands and the new edition is not issued.

☐ Do Not Agree*
If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":

The reason I joined various NFPA committees was to attempt to inject the realities of industry into the documents. This I have done poorly as I did not know the process too late. I (correct wording later? 91) was given too consideration. The current (654) (I was involved) is an academic document far removed from reality. It needs practical revision.

Please return as soon as possible but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: Jack Osborne

Date: 6-27-10

June 2010

P.S. Why hasn't NFPA instituted a training school for new members on the mandatory rules, requirements for revising the documents such as 654?
NFPA 654
TC INFORMATIONAL BALLOT for Handling and Conveying of Dusts, Vapors, and Gases
June 2010 ASSOCIATION AMENDMENT
(To Return Entire Report)

Amendment: Return Entire Report

NOTE: This Association Amendment ("Amendment") is being submitted for a ballot of the Technical Committee pursuant to section 4.7.2 of the Regulations Governing Committee Projects ("Regs"). According to the Regs, whether the results of this ballot agree or disagree with the Amendment, the default recommendation to the Standards Council will be to return to the previously adopted Document. While the Standards Council generally defers to the default recommendation prescribed by the Regs, that recommendation is not binding, and in the event of an appeal to the Standards Council, the Technical Committee ballot results will be reviewed and considered by the Council as part of its deliberations. Under NFPA rules, it is important for you to vote so the Council can take your vote into consideration during deliberations.

☐ Agree

If you agree with this amendment, the result will be to return the entire report to the committee, which means the current edition stands and the new edition is not issued.

☐ Do Not Agree*

If you do not agree with this amendment, the recommendation to the Standards Council is to process this report and issue the new edition.

☐ Abstain*

*Please give reasons for voting "Do Not Agree" or "Abstain":

See attachment.

Please return as soon as possible, but no later than Tuesday, June 29, 2010 to:

Jeanne Moreau
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
FAX: 617-984-7110

Signature: [Signature]

Name - Please Print: Jeffrey W. Sutton

Date: 6/29/2010

June 2010
NFPA 654 Return to Committee Ballot
Comments

After reading through the debate transcripts from the Association Meeting and through the various email
discussions on returning 654 to committee, I am voting in favor of returning 654 to committee for the
following reasons:

- From the Association meeting transcripts, the RCC ballot, and the emails, it is very obvious there
  is significant opposition to using the new equations due in large part to there being no
  substantiation for the proposed 0.25 entrainment factor. However, the equations do have merit,
  and therefore, I would suggest, as have others, that the new equations be placed in Chapter 5 to
  be used for performance criteria and increase the entrainment factor to 1 until better
  substantiation can be established.

- The existing dust thickness criteria do work if followed and does provide users easily
determined measurement to determine. It may be overkill in some instances if a facility is cited
by a jurisdictional authority for having an excessive dust layer in a small area, but it does work.
So, I would suggest returning this methodology to the document for prescriptive criteria in
Chapter 6.

I believe these should be workable solutions to get the new document issued.

Jeff Sutton
Global Risk Consultants.
Proposal 654-1 (A2010) Backup

654-1 Log #CP15 Final Action: Accept (Entire Document)

Submitter: Technical Committee on Handling and Conveying of Dusts, Vapors, and Gases,

Recommendation: Review entire document to: 1) Update any extracted material by preparing separate proposals to do so, and 2) review and update references to other organizations documents, by preparing proposals as required.

Update Extracted material found in Chapter 3, Definitions as shown:

3.3.26.2 Fire Wall. A wall separating buildings or subdividing a building to prevent the spread of fire and having a fire resistance rating and structural resistance rating. [221, 2006]

3.3.24 Vent Closure. A pressure-relieving cover that is placed over a vent. [68, 2007]

3.3.26.1 Fire Barrier Wall. A wall, other than a fire wall, having a fire resistance rating. [221, 2006]

3.3.26.2 Fire Wall. A wall separating buildings or subdividing a building to prevent the spread of fire and having a fire resistance rating and structural stability. [221, 2006]

Update references for NFPA and other organization documents as shown:

2.1 General

The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471


NFPA 505, Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations, 2006 edition.


2.3 Other Publications.

2.3.1 ASME Publications.

American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990.


ISA Publication.

Instrumentation, Systems, and Automation Society, P.O. Box 12277, Research Triangle Park, NC 27709.


2.3.3 Other Publication.


2.4 References for Extracts in Mandatory Sections.


2.1 General

The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.


2.4 References for Extracts in Mandatory Sections.


Substantiation: To conform to the NFPA Regulations Governing Committee Projects. NFPA 68 was added to the list of references as it is now a standard and has been included in mandatory references in several places within the standard. The extracted reference for duct was deleted and its reference extract source, NFPA 91, as a result of the Committee’s action on Committee Proposal 654-8 (Log #CP15). The Committee updated the definition for hybrid mixture based upon the reference document version in NFPA 68-2007. The updated definition does not include extract of the NFPA 68 annex material. The existing NFPA 654 annex material remains unchanged by this revision to the definition.

Committee Meeting Action: Accept

Number Eligible to Vote: 28

Ballot Results: Affirmative: 23

Ballot Not Returned: 5 Barton, J., Gillis, J., Hunter, R., Hurst, G., Ness, A.

Proposal 654-8 (A2010) Backup

654-8 Log #CP15 Final Action: Accept (3.3.10 Duct)

Submitter: Technical Committee on Handling and Conveying of Dusts, Vapors, and Gases,

Recommendation: Delete definition of duct in 3.3.10: 3.3.10 Duct: Pipes, tubes, or other enclosures used for the purpose of pneumatically conveying materials. [391, 2004]

Substantiation: The definition of duct is not needed in NFPA 654. For specific applications regarding duct construction, design and installation, NFPA 91 is the source. NFPA 654 (Section 7.6) refers to NFPA 91.

Committee Meeting Action: Accept

Number Eligible to Vote: 28

Ballot Results: Affirmative: 23

Ballot Not Returned: 5 Barton, J., Gillis, J., Hunter, R., Hurst, G., Ness, A.
Proposal 654-11 (A2010) Backup

654-11 Log #35  Final Action: Accept in Principle in Part (4.2 and 8.2.1.2)


Recommendation: Revise text to read as follows:

4.2 Process Hazard Analysis.

4.2.1* The design of the fire and explosion safety provisions shall be based on a process hazard analysis of the facility, the process, and the associated fire or explosion hazards.

4.2.2 The results of the process hazard analysis shall be documented and maintained for the life of the process.

4.2.3* If the process, equipment, or the operation does not permit elimination of dust deposits at all times, then the process hazard analysis shall specify and document maximum allowable layer thickness (or area density), minimum allowable deposit surface area, and minimum PPE requirements.

4.2.4 It shall be permitted to use the partial volume deflagration analysis method described in NFPA 68 to satisfy the requirements of Section 4.2.3(NEW) for enclosure or building heights of up to 30 ft (BlDG HEIGHT SUBJECT TO COMMITTEE CONSENSUS).

4.2.5 The process hazard analysis shall be reviewed and updated at least every 5 years.

8.2.1.2 Regular cleaning frequencies shall be established for walls, floors, and horizontal surfaces, such as equipment, ducts, pipes, hoods, ledges, and above suspended ceilings and other concealed surfaces, to ensure minimum dust accumulations never exceed the maximum quantities specified in process hazard analysis (see Section 4.2.3(NEW)) within operating areas of the facility.

Substantiation: Additional information is available for review at NFPA Headquarters.

Committee Meeting Action: Accept in Principle in Part

Revise text to read as follows:

4.2 Process Hazard Analysis.

4.2.1* The design of the fire and explosion safety provisions shall be based on a process hazard analysis of the facility, the process, and the associated fire or explosion hazards.

4.2.2 The results of the process hazard analysis shall be documented and maintained for the life of the process.

4.2.3* If the process, equipment, or the operation does not permit elimination of dust deposits at all times, then the process hazard analysis shall specify and document maximum allowable layer thickness (or area density), minimum allowable deposit surface area, and minimum PPE requirements.

4.2.4 See Chapter 6 for some methods to evaluate the dust layer thickness.

Do not add 4.2.4 as proposed. See Committee action on Committee Proposal 654-15 (Log #CP4).

4.2.5 The process hazard analysis shall be reviewed and updated at least every 5 years.

Do not revise 8.2.1.2 as proposed; see Committee Action on Proposal 654-46 (Log #30).

Committee Statement: The Committee accepted the inclusion of a new 4.2.3 and related annex item. The Committee did not add the new 4.2.4 as it conflicts with requirements introduced by the Committee’s action on Committee Proposal 654-15 (Log #CP4). See Committee Action and Substantiation for 654-15 (Log #CP4). The Committee did not accept the proposed revision to 8.2.1.2 as similar changes were made as part of the Committee’s Action on 654-46 (Log #30). See Committee Action and Statement for 654-46 (Log #30).

Number Eligible to Vote: 28

Ballot Results: Affirmative: 23

Ballot Not Returned: 5 Barton, J., Gillis, J., Hunter, R., Hurst, G., Ness, A.


654-15 Log #CP4  Final Action: Accept

(6.1)

Submitter: Technical Committee on Handling and Conveying of Dusts, Vapors, and Gases.

Recommendation: Add the following new definitions:

3.3.x Dust explosion hazard volumes: those room or building volumes where an unvented deflagration of the entrainable dust mass can result in a reduced pressure, \( P_{\text{red}} \), exceeding the ultimate dynamic strength of the weakest structural element not intended to fail.

3.3.x Dust fire hazard areas: those areas where combustible dust accumulation on exposed or concealed surfaces, outside of equipment or containers, can result in personnel injury from thermal dose during a dust deflagration, as well as areas where dust clouds of a hazardous concentration exist during normal operation.

Replace existing 6.1 with the following and renumber as needed:

6.1 General. The provisions of this section shall apply to the overall design of systems that handle combustible dusts.

6.1.1* Those portions of the process and facility where a dust explosion hazard or fire hazard exists shall be protected from the effects of these hazards in accordance with this section as well as Sections 6.2, 6.3, and 6.4 and Chapter 7.

6.1.2* Unless supported by calculations per 6.1.3 and 6.1.4, respectively, dust explosion hazard volumes and dust fire hazard areas shall be deemed to exist when total accumulated dust mass exceeds 1 kg/m\(^2\) multiplied by 5% of the building or room footprint. A.6.1.2 This is equivalent to 0.8 mm (\( \frac{1}{32} \) in.) based upon a settled bulk density of 1200 kg/m\(^3\) (75 lb/ft\(^3\)). The following equation provides a means to estimate an equivalent depth from a known value of settled bulk density.

\[
\text{Equivalent Depth (mm)} = \frac{1000 \cdot \text{Accumulation (kg/m}^2\text{)}}{\text{BulkDensity (kg/m}^3\text{)}}
\]

Eqn 6.1.2

6.1.2.1 All dust accumulated on structures above the lowest footprint shall be evaluated as if accumulated on the lowest footprint.

6.1.2.2 The maximum footprint to be used to calculate the total dust mass shall not exceed 2000 m\(^2\).

6.1.3 It shall be permitted to evaluate the threshold dust mass establishing a building or room as a dust explosion hazard volume, \( m_{\text{th}} \), per equation 6.1.3.

\[
M_{\text{th}} = \frac{P_{\text{red}} \cdot \left( \frac{C_{\text{w}}}{P_{\text{max}}} \right) \cdot A_{\text{enclo}} \cdot H}{\eta_{\text{D}}}
\]

Eqn 6.1.3

where \( M_{\text{th}} \) is the threshold dust mass (g) based upon building damage criterion, \( C_{\text{w}} \) is the worst case dust concentration (g/m\(^3\)) at which the maximum rate-of-pressure-rise in tests conducted per ASTM E1226, \( P_{\text{red}} \) is the allowable pressure (bar g) developed during a deflagration per NFPA 68, \( P_{\text{max}} \) is the maximum pressure (bar g) developed in ASTM E1226 tests with the accumulated dust sample, \( A_{\text{enclo}} \) is the enclosure floor area (m\(^2\)), \( \eta_{\text{D}} \) is the entrainment fraction and \( H \) is the enclosure ceiling height (m).

6.1.4 It shall be permitted to evaluate the threshold dust mass establishing an area as a dust fire hazard area, per equation 6.1.4.

\[
M_{\text{fu}} = 0.05 \left( \frac{C_{\text{w}}}{1 + P_{\text{max}}} \right) \cdot A_{\text{enclo}} \cdot S
\]

Eqn 6.1.4

Where, \( M_{\text{fu}} \) is the threshold dust mass (g) based upon personnel fire exposure criterion.

6.1.5* It shall be permitted to assume a default value of 0.25 for the entrainment fraction (\( \eta_{\text{D}} \)).

A.6.1.5 A higher value for \( \eta_{\text{D}} \) is more appropriate for ducts and small enclosures less than 100 m\(^2\) and for enclosures with L/D ratios greater than 5, such as galleries. Research activities are currently in progress to define a technical basis for estimating \( \eta_{\text{D}} \).

6.1.6 It shall be permitted to use a lower value of \( \eta_{\text{D}} \) based on a risk evaluation that is acceptable to the authority having jurisdiction.

6.1.7 Dust accumulation amounts shall reflect the conditions resulting from routinely scheduled cleaning, and not include short term accumulations cleaned in accordance with Chapter 8.

Substantiation: The current building codes do not establish when a building or room must be protected against a dust explosion. Nor do they set the allowable deposit surface area, and minimum PPE requirements.

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This proposal does not set a maximum amount of dust accumulation in a facility. Instead, just as for other materials, it establishes additional protection requirements when a certain amount of accumulation is exceeded.

The criteria for a dust explosion hazard is based on the ability to produce overpressures sufficient to cause building structural failure in the absence of some explosion protection method, typically venting. This is based on the worst case dust concentration, meaning that concentration and its associated maximum deflagration pressure, P, which is the largest of the two factors. The worst case fill fraction would come from NFPA-68, section 8.3.4.

The criteria for a dust fire hazard area is based on local fugitive dust accumulation exceeding a mass of 1 kg/m² on a single square meter of surface between routine cleaning. This amount of dust, if dispersed, could create an explosible dust cloud of 2 to 4 meters high in a local area. Such a cloud would present a potential for a flash fire with personnel injury as well as ignition of other combustibles. Engineered dust collection and a sufficient routine housekeeping schedule can minimize the fire hazard areas.

If fugitive equipment leaks, then a local accumulation exceeding the 1 kg/m² criteria between scheduled general cleaning would be cleaned up in shorter times as the local accumulation rate increases.

A small dust fire hazard area would require manual fire protection. If the process results in more than 5% of the fire-separated area (room or floor) exceeding the criteria between routine cleaning, effectively a minimum average of 0.05 kg/m² or 10%-20% of the MEC, the entire area would be protected with automatic fire suppression. This includes all the areas which experience short term accumulations beyond 1 kg/m² in a typical 24 hour operation, the longest allowed local cleaning period.

The need for electrically classified equipment for ignition prevention is clearly separated from the explosion and fire hazards. The dust layer thickness, that is 0.1 mm, used to determine electrical classification, is less than those for provision of automatic fire suppression or explosion protection.

Committee Meeting Action: Accept
Number Eligible to Vote: 28
Ballot Results: Affirmative: 20 Negative: 3
Ballot Not Returned: 5 Barton, J., Gillis, J., Hunter, R., Hurst, G., Ness, A.
Explanations of Negative:

CHOLIN, J.: The proposal introduces the term “dust fire” which is not defined nor is it distinguished from the term “deglagration” that has been used for decades in this and numerous other NFPA documents. The submitter has not substantiated the need or advisability for introducing this new term.

The committee proposal is too complex to be routinely enforced by non-engineers for determining if a has are exist or not. The proposed material should be included in an appendix to Chapter 5 as a manual of practice.

The committee proposal calculations rely on the concentration producing the maximum pressure, not the minimum concentration that propagates a deflagration flame front, MEC. This leads to under-assessment of the hazard.

SUTTON, J.: While I agree with the concept of establishing hazard areas based on the amounts of dust, I do not agree with using an entrainment factor of 0.25 in these equations as this would result in an increase in the amount of dust allowed in an area and there is not an adequate technical basis for using a 0.25 entrainment factor.

URAL, E.: Change eta(sub)J value to 1.0 for elevated deposits, and 0.25 for ordinary floor deposits

Committee Ballot Affirmative:

BEATTIE, W.: The 0.25 factor is not substantiated. This may permit higher than acceptable levels of dust. If any factors less than 1 is used, the use of the factor should be substantiated by tests.

Proposal 654-46 (A2010) Backup

654-46 Log #30 Final Action: Accept in Principle
(Chapter 8)

Submitter: Mark L. Holcomb, Kimberly-Clark Corporation

Recommendation: Add new text to read as follows:

Chapter 8 - Fugitive Dust Control and Housekeeping

8.1 - Fugitive Dust Control

8.1.1 Equipment and processes shall be designed, maintained and operated in a manner that minimizes the release of fugitive dust into the building environment.

8.1.2 – Control Equipment Design

Processes shall be designed to minimize or eliminate the release of combustible dust. Engineering controls shall be provided for processes where combustible dust is liberated during normal operation. Ventilation controls shall be designed in accordance with criteria specified in the current edition of the American Conference of Governmental Industrial Hygienists (ACGIH) Industrial Ventilation Manual. Dust collectors or other types of air material separation devices shall be designed to collect dust. To the extent possible, dust collector designs shall eliminate explosion hazards by reducing dust concentrations inside collector housings below the MEC. Ducts used to convey air containing dust shall be designed to maintain air transport velocities that are high enough to prevent dust from accumulating inside ducts.

8.1.3 – Control Equipment Maintenance

Engineering controls shall be maintained to the original design specifications and the performance of these systems must be initially validated after installation and periodically validated thereafter. Written operating and maintenance procedures must be developed and maintained for all engineering controls and related equipment. The frequency and method used to validate system performance should be based on manufacturers recommendations, operating experience, and the severity of the consequence of system or individual component failure. Both routine instrumentation and visual inspections should be considered. A corrective action system must be implemented that prioritizes corrective actions based on risk. The corrective action system must specify closure schedules and track closure status.

8.2 – House Keeping

All housekeeping requirements shall be applied equally.

8.2.1 – Control of Fugitive Dust Accumulations through building design and ventilation.

To the extent possible, overhead building structures, process and electrical equipment, lighting and other overhead surfaces should be configured to minimize or prevent the accumulation of fugitive dust. Active methods of reducing dust concentrations in vertical building structures, including high-voltage HVAC and fans mounted in the overheads may also be deployed where practical. Active control methods must be operated frequently enough to ensure that accumulated dust levels that are removed by these systems never exceed 50% of the maximum allowable dust accumulation.

8.2.2 – Housekeeping Frequency

The housekeeping frequency shall be established to ensure that the accumulated dust levels on walls, floors, and horizontal surfaces do not exceed the maximum allowable dust accumulation. A planned inspection process must be implemented to periodically evaluate dust accumulation rates and determine changes in the rate that change housekeeping frequency. Factors that should be considered in establishing the housekeeping frequency include:

- Variability of dust emissions.
- Impact of process changes and non-routine activities.
- Variability of accumulations on different surfaces within the room (walls, floors, overheads).

Un-scheduled housekeeping must be conducted to clean localized dust accumulations that exceed 1 kg/m² in any area greater than 200 square feet (19 square meters). These accumulations may result from spills, process leaks, and other process upssets. The unscheduled housekeeping must be conducted within 24 hours.

8.2.3 – Housekeeping Methods

Combustible dust accumulations from surfaces shall be cleaned in a manner that minimizes the risk of generating a hazardous dust cloud. A written housekeeping procedure must be developed that addresses the following aspects:

- A risk analysis that considers the specific characteristics of the dust being cleaned (particle size, moisture content, MEC, MIE) and other safety risks introduced by the cleaning methods used.
- 2. Personal Safety procedures and personal protective equipment (PPE)
- 3. Cleaning sequence.
- 4. Cleaning methods used.
- 5. Equipment, including lifts, vacuum systems, attachments, etc.
- Compressed air must not be used to clean confined spaces, including vessels, process equipment or small rooms whose volume is less than 2000 ft³ (57 m³).

Compressed air may be used to clean if the following conditions are met:

1. Vacuum cleaning or wet cleaning methods are used to clean surfaces that can be safely accessed prior to using compressed air.

2. If dust accumulations in the area being cleaned are less than 50% of the maximum allowable dust accumulation and no localized accumulations exceed 0.5 kg/m².

3. Compressed air use is limited to cleaning inaccessible surfaces or surfaces where other methods of cleaning result in a greater personal safety risk to those performing the cleaning.

4. The lowest air pressure that provides effective cleaning is used.

5. All electrical equipment potentially exposed to airborne dust in the area meets NEMA 12 (dust tight) requirements.

6. Ignition sources and hot surfaces capable of igniting a dust cloud or dust layer are shut down or removed from the area.

8.2.4 – Vacuum Cleaners

Central vacuum systems (fixed pipe suction system with remotely located expauster and dust collector) shall be installed in conformance with Section 7.13.

Portable vacuum systems shall be certified by the manufacturer to meet the hazard classification of the area where they will be used (non-classified, class I, II, or III). Portable vacuum systems must be used in accordance with the manufacturers’ requirements to ensure that the hazard classification is maintained.

Substantiation: Chapter 8, sections 8.1.1 and 8.1.2 need to be revised to align with accepted industrial hygiene control hierarchy and ventilation system design criteria.

Section 8.1.3: This change provides practical guidance for applying recognized ventilation system design and maintenance criteria.

Section 8.2.2 - The 200 sq ft area limit is identified in FM 7-76.

Section 8.2.3 – This section was revised to provide guidance for dust accumulations that result from other leaks.

Section 8.2.4 – All equipment used in hazardous locations must meet the hazard class of the location. There is no technical reason to require classified vacuums for combustible dust unless it is being used in a hazardous location.

Vacuuming does not generate a hazardous dust cloud in the room environment.
Committee Meeting Action: Accept in Principle

Revise Section 8.2 as shown:

8.2 Housekeeping. All requirements of 8.2.1 through 8.2.3 shall be applied retroactively.

8.2.1 Cleaning Frequency

8.2.1.1* The housekeeping frequency shall be established to ensure that the accumulated dust levels on walls, floors, and horizontal surfaces, such as equipment, ducts, pipes, hoods, ledges, beams, and above suspended ceilings and other concealed surfaces, such as interior of electrical enclosures, does not exceed the threshold dust mass/accumulation.

8.2.1.2* A planned inspection process shall be implemented to evaluate dust accumulation rates and the housekeeping frequency required to maintain dust accumulations below the threshold dust mass/accumulation.

A.8.2.1.1 Factors that should be considered in establishing the housekeeping frequency include:

- Variability of fugitive dust emissions.
- Impact of process changes and non-routine activities.
- Variability of accumulations on different surfaces within the room (walls, floors, overheads).

A.8.2.1.2* Un-scheduled housekeeping should be performed in accordance with Table A.8.2.1.2 (a) to limit the time that a local spill or short-term accumulation of dust is allowed to remain before cleaning the local area to less than the threshold dust mass/accumulation.

### Table A.8.2.1.2(a) Un-Scheduled Housekeeping

<table>
<thead>
<tr>
<th>Accumulation on the worst single square meter of surface</th>
<th>Longest Time to Complete Un-scheduled Local Cleaning of Floor-Accessible Surfaces</th>
<th>Longest Time to Complete Un-scheduled Local Cleaning of Remote Surfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;1 to 2 times threshold dust mass/accumulation</td>
<td>8 hours</td>
<td>24 hours</td>
</tr>
<tr>
<td>&gt;2 to 4 times threshold dust mass/accumulation</td>
<td>4 hours</td>
<td>12 hours</td>
</tr>
<tr>
<td>&gt;4 times threshold dust mass/accumulation</td>
<td>1 hour</td>
<td>3 hours</td>
</tr>
</tbody>
</table>

Table A8.2.1.2 (b) shows approximate equivalent depths for the accumulation values in Table A.8.2.1.2 (a) when the threshold dust mass/accumulation is 1 kg/m². The owner/operator can use an approximate depth to facilitate communication of housekeeping needs.

### Table A.8.2.1.4 Unscheduled Housekeeping

<table>
<thead>
<tr>
<th>Accumulation on the worst single square meter of surface</th>
<th>Average Depth</th>
<th>Average Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>at 75 lb/ft²</td>
<td>at 30 lb/ft²</td>
</tr>
<tr>
<td>&gt;1 to 2 kg/m²</td>
<td>&gt;0.7 - 0.9 in.</td>
<td>&gt;0.4 - 0.6 in.</td>
</tr>
<tr>
<td>&gt;2 to 4 kg/m²</td>
<td>&gt;1.0 - 1.5 in.</td>
<td>&gt;0.5 - 0.8 in.</td>
</tr>
<tr>
<td>&gt;4 kg/m²</td>
<td>&gt;1.8 - 2.3 in.</td>
<td>&gt;0.9 - 1.3 in.</td>
</tr>
</tbody>
</table>

8.2.2 Cleaning Methods

8.2.2.1 Surfaces shall be cleaned in a manner that minimizes the risk of generating a fire or explosion hazard.

8.2.2.2 Vacuum cleaning shall be the preferred method. Where other cleaning methods are required, water wash-downs or sweeping shall be permitted to be used.

8.2.2.3* Blow downs using compressed air or steam shall be permitted to be used for cleaning inaccessible surfaces or surfaces where other methods of cleaning result in greater personal safety risk. Where blow down using compressed air is used, the following precautions shall be followed:

1. Dust accumulations in the area being cleaned do not exceed the threshold dust mass/accumulation.

2. Vacuum cleaning or wet cleaning methods are used to clean surfaces that can be safely accessed prior to using compressed air.

3. Compressed air hoses are equipped with pressure relief nozzles meeting OSHA requirements (30 psig – 29 CFR 1910.242(b)).

4. All electrical equipment potentially exposed to airborne dust in the area meets NFPA 70, National Electrical Code (NEC) NEMA 12 (dust tight) requirements, or equivalent.

5. All ignition sources and hot surfaces capable of igniting a dust cloud or dust layer are shut down or removed from the area.

A.8.2.2.3 – All of the listed precautions might not be required for limited use of compressed air for cleaning minor accumulations of dust from machines or other surfaces between shifts. A risk assessment should be conducted to determine which precautions are required under the specific conditions that compressed air is being used.

8.2.2.4* Housekeeping procedures shall be documented in accordance with the requirements of Section 4.2 and 4.3.

A.8.2.2.4 Items that should be included in the housekeeping procedure include:

1. A risk analysis that considers the specific characteristics of the dust being cleaned (particle size, moisture content, MEC, MIE) and other safety risks introduced by the cleaning methods used.

2. Personal safety procedures, including fall protection when working at heights.

3. Personal protective equipment (PPE), including flame-resistant garments in accordance with the hazard analysis required by NFPA 2113.

4. Cleaning sequence.

5. Cleaning methods to be used.

6. Equipment, including lifts, vacuum systems, attachments, etc.

8.2.3 Vacuum Cleaners

See Committee Action on Proposal 654-49 (Log #48) for revisions to 8.2.3 on vacuum cleaners.

Committee Statement: A requirement for planned inspections based on accumulation rates and factors that impact the accumulation rates is needed to ensure the housekeeping plan is adjusted to address changes in the accumulation rates.

The second requirement in the current standard (electrical equipment not meeting Class II requirements must be shut down or removed from the area) effectively establishes the requirement for the area to be classified (meet class II criteria) when compressed air is used for cleaning. This requirement is too restrictive if the amount of dust in the area where compressed air is being used is below the dust threshold. If the amount of dust is below the threshold, by definition a dust cloud hazard cannot exist.

The current requirements for compressed air pressure limited to 15 psig are not based on OSHA requirements and are too restrictive to allow effective cleaning in most circumstances. The current 15 psig restriction will result in the inability to clean fugitive dust accumulations in restricted access areas resulting in a greater risk of fire or explosion. The OSHA requirement states that when using compressed air for cleaning, pressure relief must be provided to reduce air pressure to 30 psig or less when the nozzle is deadheaded (see OSHA web site for interpretation letter). Typically, compressed air used for cleaning is at standard plant pressure. Requiring pre-vacuuming of accessible surfaces further reduces any risk by removing a portion of the dust prior to using compressed air.

The current standard does not require a written housekeeping procedure which identifies and addresses other risks introduced by the housekeeping, including working at heights. A written procedure is an administrative requirement that helps ensure the plan has been well thought out and it provides a vehicle that facilitates employee communications and training.

See Committee Action and Committee Statement on Proposal 654-49 (Log #48) regarding revisions to requirements for vacuum cleaners.

Number Eligible to Vote: 28

Ballot Results: Affirmative: 23

Ballot Not Returned: 5 Barton, J., Gillis, J., Hunter, R., Hurst, G., Ness, A.

Comment on Affirmative:

JENNETT, J.: A.8.2.1.2 This could require facilities to pay unnecessary overtime.

HOLCOMB, M.: I am not in agreement with inclusion of section A.8.2.1.2 Unscheduled Housekeeping.

JENNITT, J.: A.8.2.1.2* This could require facilities to pay unnecessary overtime.

Ballot Not Returned: 5 Barton, J., Gillis, J., Hunter, R., Hurst, G., Ness, A.

Comment on Affirmative:

JENNETT, J.: A.8.2.1.2 This could require facilities to pay unnecessary overtime.

HOLCOMB, M.: I am not in agreement with inclusion of section A.8.2.1.2 Unscheduled Housekeeping.

JENNITT, J.: A.8.2.1.2* This could require facilities to pay unnecessary overtime.

Ballot Not Returned: 5 Barton, J., Gillis, J., Hunter, R., Hurst, G., Ness, A.
Proposal 654-12 (A2010) Backup

654-12 Log #CP11 Final Action: Accept (4.4 (New))

Submitter: Technical Committee on Handling and Conveying of Dusts, Vapors, and Gases,
Recommendation: Add a new 4.4 on Incident Investigation and remove remaining sections:
4.4 Incident Investigation.
4.4.1* Every incident that results in a fire or explosion shall be investigated and recorded.
4.4.2* Once the scene has been released by the authority having jurisdiction, incident investigations shall be promptly initiated by management personnel or their designee who has a good working knowledge of the facility and processes.

Add the following annex material:
A.4.4.1 The size and extent of the incident that triggers this requirement should be proportional to the hazard. For example, a spark in a protected duct with a spark detection system would likely not require an investigation unless a significant increase in sparks per unit time was noted or the spark fails to be extinguished. This incident is considered “recorded” with the spark detection system. For every hazard area, there is a de minimis level below which recording cannot be justified. It is up to the owner/operator to determine that level.

A.4.4.2 Incident reports should include the following information:
(1) Date of the incident
(2) Location of the incident and equipment/process involved
(3) Description of the incident, contributing factors, and the suspected cause
(4) Operation of automatic/manual fire protection systems and emergency response
(5) Recommendations and corrective actions taken or to be taken to prevent a recurrence

The incident report should be reviewed with appropriate management personnel and retained on file for future reference. The recommendations should be addressed and resolved.

Substantiation: The Committee acknowledges industry best practice by incorporating a new provision on incident investigation.
Committee Meeting Action: Accept
Number Eligible to Vote: 28
Ballot Results: Affirmative: 22 Negative: 1
Ballot Not Returned: 5 Barton, J., Gillis, J., Hunter, R., Hurst, G., Ness, A.

Explanation of Negative:
GUARICCI, D.: An incident that results in a fire and/or an explosion needs investigation regardless as to whether a protection system is present or not. The very protection system in question may have failed in its objective. Appendix 4.4.4 should be removed as it leads to an understanding that existing protection methods should not be reviewed.

Comment on Affirmative:
SCHERPA, T.: The proposed new A.4.4.1 should be revised to read: “A.4.4.1 The size and extent of the incident triggered by this requirement...” instead of “A.4.4.1 The size and extent of the incident that triggers this requirement...”

Proposal 654-14 (A2010) Backup

654-14 Log #85 Final Action: Accept in Principle in Part (Chapter 6, 7, and 8)

Submitter: Samuel A. Rodgers, Honeywell, Inc.
Recommendation: Revise as follows:
The current building codes do not establish when a building or room must be protected against a dust explosion. Nor do they set the allowable quantity of a hazardous (combustible) dust in a control area, above which automatic fire suppression is required. Similar to NFPA-30 for liquids, NFPA-654 should establish these limits for dusts. Also, similar to NFPA-30, NFPA-654 should establish an acceptable amount of material in process, in this case, escaped dust.

This proposal clarifies when a Dust Explosion hazard and a Dust Fire Hazard exist in an operation handling combustible dust. The current text mentions situations but provides no quantitative method to determine how much dust or what distribution of dust results in the hazard. In addition, the current text does not clearly differentiate between dust accumulations requiring electrical classification or those presenting a dust explosion hazard.

This proposal does not set a maximum amount of dust accumulation in a facility. Instead, just as for other materials, it establishes additional protection requirements when a certain amount of accumulation is exceeded. The criteria for a dust explosion hazard is based on the ability to produce overpressure sufficient to cause building structural failure in the absence of some explosion protection method, typically venting. This is based on the worst case dust concentration, measuring that concentration and its associated maximum deflagration pressure, Pmax, which give the largest building fill fraction. The worst case fill fraction would come from NFPA-68, section 8.3.4.

The provisions of this section shall apply to the overall design of systems that handle combustible particulate solids, dusts.

The Committee should be aware that this analytical approach includes dust accumulation and fire protection as specific protective measures. This is based on the worst case dust concentration, measuring that concentration and its associated maximum deflagration pressure, Pmax, which gives the largest building fill fraction. The worst case fill fraction would come from NFPA-68, section 8.3.4.

The criteria for a dust explosion hazard is based on the ability to produce overpressure sufficient to cause building structural failure in the absence of some explosion protection method, typically venting. This is based on the worst case dust concentration, measuring that concentration and its associated maximum deflagration pressure, Pmax, which give the largest building fill fraction. The worst case fill fraction would come from NFPA-68, section 8.3.4.

Xr = worst-case building partial fraction

Where:
Xr = worst-case dust concentration
H = ceiling height of the building

A.4.4.2 Incident reports should include the following information:
(1) Date of the incident
(2) Location of the incident and equipment/process involved
(3) Description of the incident, contributing factors, and the suspected cause
(4) Operation of automatic/manual fire protection systems and emergency response

A.4.4.3 Recommendations and corrective actions taken or to be taken to prevent a recurrence

Number Eligible to Vote: 28
Ballot Results: Affirmative: 22 Negative: 1
Ballot Not Returned: 5 Barton, J., Gillis, J., Hunter, R., Hurst, G., Ness, A.

Explanation of Negative:
GUARICCI, D.: An incident that results in a fire and/or an explosion needs investigation regardless as to whether a protection system is present or not. The very protection system in question may have failed in its objective. Appendix 4.4.4 should be removed as it leads to an understanding that existing protection methods should not be reviewed.

Comment on Affirmative:
SCHERPA, T.: The proposed new A.4.4.1 should be revised to read: “A.4.4.1 The size and extent of the incident triggered by this requirement...” instead of “A.4.4.1 The size and extent of the incident that triggers this requirement...”
6.1.2* Dust Explosion Hazard Volume. (all of Kirby annex)

6.1.2.1 Dust explosion hazard volumes shall include those room or building volumes where an unvented deflagration of the worst case explosive dust fill fraction, $X_r$, can result in a reduced pressure, $P_{red}$, exceeding the ultimate dynamic strength of the weakest structural element not intended to fail.

6.1.2.x Dust quantities used to evaluate the dust fill fraction shall include all combustible dusts in the room or building volume, including that in open and closed containers, except as modified by 6.1.2.2 to 6.1.2.4.

6.1.2.2 Where dust accumulations exceed the dust layer control criterion over more than 0.5% of the surface area within the room/building, an engineering analysis shall be performed to determine acceptability of construction with respect to explosion protection in accordance with NFPA 68, Explosion Protection by Deflagration Venting, 2007 Edition, Chapter 8.3.4.

6.1.2.3 Quantities of dust in otherwise explosion-protected equipment or in sealed shipping containers shall not be included in the determination of the fill fraction for the room or building.

6.1.2.4 Dust accumulation amounts shall reflect the worst case for routinely scheduled cleaning and not include short term accumulations cleaned within the times allowed in Chapter 9.

6.1.2.x For existing installations, the actual dust accumulation between routinely scheduled cleaning shall be documented.

6.1.2.x For new installations, the anticipated dust accumulation shall be permitted to be estimated for purposes of determining dust fill fraction.

6.1.2.x.1 If dust accumulation is initially estimated, the owner/operator shall document the actual dust accumulation within one month after the new installation is operational.

6.1.2.x.2 If dust accumulation is initially estimated, the owner/operator shall either adjust routine cleaning schedule or modify dust containment methods to achieve at most the estimated dust accumulation within 6 months after the new installation is operational.

6.1.2.5 Small volume enclosures or gallery-type enclosures shall have lower limits of acceptable dust accumulation, based on an evaluation acceptable to the authority having jurisdiction (see A.6.1.2).

6.1.2.5 Dust explosion hazard volumes shall be segregated or detached from other volumes in the same occupancy.

6.1.3 Dust Fire Hazard Area.

6.1.3.1* Dust fire hazard areas shall include those areas where combustible dust accumulation on exposed or concealed surfaces, outside of equipment or containers, exceeds the dust layer control criterion, as well as areas where dust clouds of a hazardous concentration exist during normal operation.

6.1.3.2 The dust layer control criterion shall be 1 kg/m² of horizontal floor area beneath the accumulation for a nominal 3 meter room/building height and shall be raised up or down as a function of room/building height to a maximum of 4 kg/m² for a 12 meter room/building height.

A.6.1.3.2 The following equation provides a means to estimate an equivalent depth from a known value of settled bulk density:

$$\text{Equivalent Depth (mm)} = \frac{1000 \cdot \text{Accumulation (kg/m}^2\text{)}}{\text{Bulk Density (kg/m}^3\text{)}}$$

6.1.3.3 Dust fire hazard areas shall be segregated or separated from other areas in the same occupancy.

6.1.3.4 The extent of fire protection and control that is provided for those portions of a facility containing a dust fire hazard area shall be determined by means of an engineering evaluation of the facility and application of sound fire/explosion protection and process engineering principles. This evaluation shall include, but not be limited to, the following:

- Analysis of the fire hazards of the operation and dust accumulations
- Analysis of facility and system designs and special fire protection in other parts of this chapter and in Chapter 10
- Analysis of the emergency response capabilities of the local emergency services

6.1.4 Recycling of Air–Material Separator Exhaust. Recycling of air-material separator exhaust to buildings shall be permitted if the system is designed to prevent both return of dust with an efficiency of 99.9 percent at 10 m and transmission of energy from a fire or explosion to the building.

6.1.4.1 Recycling of air-material separator exhaust to the building shall not be permitted under any circumstances when combustible gases or vapors or hybrid mixtures are involved.

6.1.4.2* Recycling of air-material separator exhaust to the building shall not be permitted when the recycled stream reduces the concentration of oxygen below 19.5 percent by volume in the work area.

A.6.1.4.2 (renumbered A.6.1.3.2)

(Repealed in Chapter 10)

6.1.5* Where a pneumatic conveying system or any part of such systems operates as a positive-pressure-type system and the air-moving device’s gauge discharge pressure is 15 psi (103 kPa) or greater, the system shall be designed in accordance with Section VIII of the ASME Boiler and Pressure Vessel Code or ASME B31.3, Process Piping.

6.1.6 All components of pneumatic conveying systems that handle combustible particulate solids shall be designed to be dusttight, except for openings designed for intake and discharge of air and material.

6.2 Segregation, Separation, or Detachment of Combustible Dust Handling and Processing Areas.

6.2.1 General. Areas in which combustible dusts are produced, processed, handled, or collected shall be detached, segregated, or separated from other occupancies to minimize damage from a fire or explosion.

6.2.2 Use of Segregation.

6.2.2.1 Physical barriers that are erected to segregate dust fire hazard areas shall be a minimum 1 hour fire separation assembly, including seals at all penetrations of floors, walls, ceilings, or partitions.

6.2.2.2 Physical barriers that are erected to segregate dust explosion hazard volumes shall be designed to preclude failure of those barriers during a dust explosion per NFPA-68, Standard on Explosion Protection by Deflagration Venting.

6.2.2.3 Doors and openings shall not be permitted in physical barriers unless they are normally closed and have at least the strength and fire endurance rating required of the physical barrier.

6.2.3 Use of Separation.

6.2.3.1* When separation is used to limit the dust fire hazard area, the required separation distance between the fire hazard area identified in 6.1.3 and surrounding exposures shall be determined by the following:

1. Engineering evaluation that addresses the properties of the materials
2. Type of operation
3. Amount of material likely to be present outside the process equipment
4. Building design
5. Nature of surrounding exposures

6.2.3.2 In no case shall the separation distance be less than 30 ft (9 m).

6.2.3.3 When separation is used, housekeeping, fixed dust collection systems employed at points of release, and compartmentation shall be permitted to be used to limit the extent of the dust fire hazard area.

6.3 Building Construction.

6.3.1 All buildings shall be of Type I or Type II construction, as defined in NFPA 220, Standard on Types of Building Construction.

6.3.2* Where local, state, or national building codes are more restrictive, modifications shall be permitted for conformance to those codes.

6.3.3* Interior surfaces where dust accumulations can occur shall be designed and constructed so as to facilitate cleaning and to minimize combustible dust accumulations.

6.3.4 Spaces inaccessible to housekeeping shall be sealed to prevent dust accumulation.

6.3.5 Interior walls erected for the purpose of limiting fire spread shall have a minimum 1-hour fire resistance rating and shall be designed in accordance with NFPA 221, Standard for High Challenge Fire Walls, Fire Walls, and Fire Barrier Walls.

6.3.6 Fire Doors.

6.3.6.1 Openings in fire walls and in fire barrier walls shall be protected by self-closing fire doors that have a fire resistance rating equivalent to the wall design.
6.3.6.2 Fire doors shall be installed according to NFPA 80, Standard for Fire Doors and Fire Windows, and shall normally be in the closed position.


6.3.8 Penetrations. Where floors, walls, ceilings, and other partitions have been erected to control the spread of fire or deflagrations, penetrations in these structures shall be sealed to maintain their fire endurance rating and maintain physical integrity in a deflagration. (See 7.6.5.)

6.3.9 Fire Resistance Rating.

6.3.9.1 Interior stairs, elevators, and manlifts shall be enclosed in dusttight shafts that have a minimum fire resistance rating of 1 hour.

6.3.9.2 Doors that are the automatic-closing or self-closing type and have a fire resistance rating of 1 hour shall be provided at each landing.

6.3.9.3 Stairs, elevators, and manlifts that serve only open-deck floors, mezzanines, and platforms shall not be required to be enclosed.

Deflagration Venting.

Deflagration vent closures should be designed such that, once opened, they remain open to prevent failure from the vacuum following the pressure wave. Updates are suggested here to be in compliance with NFPA 69, which recently eliminated choices as an acceptable isolation device and introduced design limitations for rotary valves alone, as opposed to rotary valves with an additionally maintained material layer above the valve.

A.6.4.1* Floors and load-bearing walls that are exposed to dust explosion hazards shall be designed to preclude failure during a dust explosion, as determined according to NFPA-68, Standard on Explosion Protection by Deflagration Venting.

6.4 Explosion Protection.

A.6.4.1 A dust hazard explosion volume, as specified in 6.1.2, shall be provided with explosion protection in accordance with NFPA-69, Standard on Explosion Prevention Systems.

Deflagration vent closures should be designed such that, once opened, they remain open to prevent failure from the vacuum following the pressure wave.

Where building deflagration venting is needed, detaching the operation to an open structure or to a building of damage-limiting construction is the preferred method of protection. Damage-limiting construction involves a room or building that is designed such that certain interior walls are pressure resistant (can withstand the pressure of the deflagration) to protect the occupancy on the other side and some exterior wall areas are pressure relieving to provide deflagration venting. It is preferable to make maximum use of exterior walls as pressure-relieving walls (as well as the roof wherever practical), rather than to provide the minimum recommended. Further information on this subject can be found in NFPA 68, Standard on Explosion Protection by Deflagration Venting.

Deflagration vent closures should be designed such that, once opened, they remain open to prevent failure from the vacuum following the pressure wave.

Updates are suggested here to be in compliance with NFPA 69, which recently eliminated choices as an acceptable isolation device and introduced design limitations for rotary valves alone, as opposed to rotary valves with an additionally maintained material layer above the valve.

A.8.2.1.4 Table A 8.2.1.4 shows approximate equivalent depths for the accumulation values in Table 8.2.1.4 when the dust layer control criterion is 1 kg/m². The owner/operator can use an approximate depth to facilitate communication of housekeeping needs.

Table 8.2.1.4 Un-Scheduled Housekeeping

| Accumulation on the | Longest Time to | Longest Time to Complete |
| worst single square | Complete Un-scheduled | Local Cleaning of |
| meter of surface     | Floor-Accessible Surfaces | Remotely Accessible Surfaces |
| ≥1 to 2 times dust layer control criterion | 8 hours | 24 hours |
| ≥2 to 4 times dust layer control criterion | 4 hours | 12 hours |
| ≥4 times dust layer control criterion | 1 hour | 3 hours |

A.8.2.1.4 Table A 8.2.1.4 shows approximate equivalent depths for the accumulation values in Table 8.2.1.4 when the dust layer control criterion is 1 kg/m². The owner/operator can use an approximate depth to facilitate communication of housekeeping needs.

Table A 8.2.1.4 Un-Scheduled Housekeeping

<table>
<thead>
<tr>
<th>Accumulation on the worst single square meter of surface</th>
<th>Average Depth</th>
<th>Average Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥1 to 2 kg/m²</td>
<td>≥2/₃ in. (0.8-1.7 mm)</td>
<td>≥5/₈ in. (1.7-3.3 mm)</td>
</tr>
<tr>
<td>≥2 to 4 kg/m²</td>
<td>≥2/₃ in. (1.7-3.3 mm)</td>
<td>≥5/₈ in. (2.1-4.2 mm)</td>
</tr>
<tr>
<td>≥4 kg/m²</td>
<td>≥2/₃ in. (&gt;3.3 mm)</td>
<td>≥5/₈ in. (&gt;8.3 mm)</td>
</tr>
</tbody>
</table>

Substantiation: This proposal clarifies when a Dust Explosion Hazard and a Dust Fire Hazard exist in an operation handling combustible dust. The current text mentions these situations but provides no quantitative method to determine how much dust or what distribution of dust results in the hazard. In addition, the current text does not clearly differentiate between dust accumulations requiring electrical classification or those presenting a dust explosion hazard.

This proposal does not set a maximum amount of dust accumulation in a facility. Instead, just as for other materials, it establishes additional protection requirements when a certain amount of accumulation is exceeded.

The proposal includes prior additions and seeks to clarify the question of initial dust accumulation estimates for new installations.

Committee Meeting Action: Accept in Principle in Part

For action on the recommendation to address dust layer accumulation, see Committee Action on Committee Proposal 654-15 (Log #CP4).

For action on the proposed revision to 7.1.4, see Committee Action on Proposal 654-25 (Log #41).

For action on the proposed revision to 8.2 on housekeeping, see Committee Action on Proposal 654-46 (Log #30).

For action on the proposed revision to 6.1.3 on recycling air, see Committee Action on Proposal 654-17 (Log #12).

The following changes proposed in the submitter’s recommendation have been accepted as submitted:

Revise 6.2, 6.3 and 6.4 as shown.

6.2 Segregation, Separation, or Detachment of Combustible Dust Handling and Processing Areas.
6.2.1 General. Areas in which combustible dusts are produced, processed, handled, or collected shall be detached, segregated, or separated from other occupancies to minimize damage from a fire or explosion.

6.2.2 Use of Segregation.

6.2.2.1 Physical barriers that are erected to segregate dust fire hazard areas shall be a minimum 1 hour fire separation assembly, including seals at all penetrations of floors, walls, ceilings, or partitions.

6.2.2.2 Physical barriers that are erected to segregate dust explosion hazard volumes shall be designed to preclude failure of those barriers during a dust explosion per NFPA 68, Standard on Explosion Protection by Deflagration Venting. Deflagration venting. It is preferable to make maximum use of exterior walls as (can withstand the pressure of the deflagration) to protect the occupancy on the method of protection. Damage-limiting construction involves a room or (protected equipment).

6.2.3 Where building explosion venting is needed, detaching the operation to an exterior wall is required. The need for building deflagration venting is a function of equipment design, particle size, deflagration characteristics of the dust, and dispersible dusts will not be permitted to accumulate outside of explosion-protected equipment.

6.2.4* Doors and openings shall not be permitted in physical barriers unless they are normally closed and have at least the strength and fire resistance rating required for the physical barrier.

6.2.5 Use of Segregation.

6.2.5.1* When separation is used to limit the dust fire hazard area, the required separation distance between the fire hazard area identified in 6.1.3 and surrounding exposures shall be determined by the following:

- (1) Engineering evaluation that addresses the properties of the materials
- (2) Type of operation
- (3) Amount of material likely to be present outside the process equipment
- (4) Building design
- (5) Nature of surrounding exposures

6.2.5.2* When separation is used, housekeeping, fixed dust collection systems employed at points of release, and compartmentation shall be permitted to be used to limit the extent of the dust fire hazard area.

6.2.6 Building Construction.

6.2.6.1 All buildings shall be of Type I or Type II construction, as defined in NFPA 220, Standard on Types of Building Construction.

6.2.6.2 Where local, state, or national building codes are more restrictive, modifications shall be permitted for conformance to those codes.

6.2.6.3* Interior surfaces where dust accumulations can occur shall be designed and constructed so as to facilitate cleaning and to minimize combustible dust accumulations.

6.2.7 Spaces inaccessible to housekeeping shall be sealed to prevent dust accumulation.

6.2.8* Interior walls erected for the purpose of limiting fire spread shall have a minimum 1-hour fire resistance rating and shall be designed in accordance with NFPA 221, Standard for High Challenge Fire Walls, Fire Walls, and Fire Barrier Walls.

6.2.9 Fire Doors.

6.2.9.1 Openings in fire walls and in barrier walls shall be protected by self-closing fire doors that have a fire resistance rating equivalent to the wall design.

6.2.9.2 Fire doors shall be installed according to NFPA 80, Standard for Fire Doors and Fire Windows, and shall normally be in the closed position.


6.3 Penetrations. Where floors, walls, ceilings, and other partitions have been erected to control the spread of fire or deflagrations, penetrations in these structures shall be sealed to maintain their fire endurance rating and maintain physical integrity in a deflagration. (See 7.6.5.)

6.3.1 Fire Resistance Rating.

6.3.2 Interior stairs, elevators, and manlifts shall be enclosed in dusttight shafts that have a minimum fire resistance rating of 1 hour.

6.3.3* Doors that are the automatic-opening or self-closing type and have a fire resistance rating of 1 hour shall be provided at each landing.

6.3.4 Stairs, elevators, and manlifts that serve only open-deck floors, mezzanines, and platforms shall not be required to be enclosed.

6.3.5* Floors and load-bearing walls that are exposed to dust explosion hazard volumes shall be designed to preclude failure during a dust explosion as determined according to NFPA 68, Standard on Explosion Protection by Deflagration Venting.

6.4* Explosion Protection.

6.4.1 A dust explosion hazard volume, as specified in 6.1.2, shall be provided with explosion protection in accordance with NFPA 69, Standard on Explosion Prevention Systems or NFPA 68, Standard on Explosion Protection by Deflagration Venting.

6.4.2 For buildings or rooms, the typical explosion protection method is deflagration venting. The need for building deflagration venting is a function of equipment design, particle size, deflagration characteristics of the dust, and housekeeping results. As a rule, deflagration venting is recommended unless there can be reasonable assurance that hazardous quantities of combustible and dispersible dusts will not be permitted to accumulate outside of explosion-protected equipment.

Where building explosion venting is needed, detaching the operation to an open structure or to a building of damage-limiting construction is the preferred method of protection. Damage-limiting construction involves a room or building design such that certain interior walls are pressure-resistant (can withstand the pressure of the deflagration) to protect the occupancy on the other side and some exterior wall areas are pressure-relieving to provide deflagration venting. It is preferable to make maximum use of exterior walls as pressure-relieving walls (as well as the roof wherever practical), rather than to provide the minimum recommended. Further information on this subject can be found in NFPA 68, Standard on Explosion Protection by Deflagration Venting.

Deflagration vent closures should be designed such that, once opened, they remain open to prevent failure from the vacuum following the pressure wave.

Committee Statement: See Committee Action and Substantiation on Committee Proposal 654-15 (Log #CP4) regarding the Committee’s revision to the requirements for dust accumulation thresholds. See Committee Action and Statement on Proposal 654-25 (Log #41) regarding the Committee revision to the explosion isolation requirements. See Committee Action and Statement on Proposal 654-46 (Log #30) regarding the Committee revision of the housekeeping requirements in 8.2 of the standard. See Committee Action and Statement on Proposal 654-17 (Log #12) regarding the Committee revision to the requirements for recycling air. These actions address all the areas proposed by the submitter in the recommendation, and the Committee believes its actions satisfy the intent of the submitter in each instance.

Number Eligible to Vote: 28

Ballot Results: Affirmative: 23

Ballot Not Returned: 5

Barton, J., Gillis, J., Hunter, R., Hurst, G., Ness, A.

Affirmative: 23

Revise 7.1.4.1 to read as follows:

7.1.4.1 Where an explosion hazard exists, isolation devices shall be provided to prevent deflagration propagation between pieces of equipment connected by ductwork.

7.1.4.2 The requirement of 7.1.4.1 shall not apply where all of the following conditions are met:

- The material being conveyed is not a metal dust or hybrid mixture
- The connecting ductwork is smaller than 4 inches in diameter
- The maximum concentration of dust conveyed through the duct is less than 25% of the MEC of the material
- The conveying velocity is high enough to prevent accumulation of combustible dust in any part of the duct
- All connected equipment is properly designed for explosion protection

Substantiation: The current requirement applies to all connecting ductwork regardless of size. The AIChE CCPS Guidelines for Safe Handling of Powders and Bulk Solids states that the probability of propagation is low if the first three criteria above are met. The fourth criteria is supported by text in the FM Global datasheet FM 7-76. The fifth criteria is supported by the current Appendix E.3.1.

By adding this exemption, users would be able to exclude some ductwork from the isolation requirement without requiring the risk assessment per section 7.1.4.

Committee Meeting Action: Accept in Principle in Part

Revise Annex to 7.1.4 by adding the following to the existing annex at the end:

A.7.1.4 Methods of explosion protection using containment, venting, and suppression protect the specific process equipment on which they are installed. Figure 7.1.4A on deflagration protection, see Annex C1.5.3.

Chokes, flame front diverters, and abort gates are not acceptable devices for explosion isolation due to lack of specific test standards to validate the design. However, these devices can still provide benefits such as reducing pressure transmitted to connected equipment.

Revise 7.1.4.1 to read as follows:

Add new text to read as follows:

7.1.4.1 Where an explosion hazard exists, isolation devices shall be provided to prevent deflagration propagation between pieces of connected equipment connected by ductwork.

7.1.4.2 The requirement of 7.1.4.1 shall not apply where all of the following conditions are met:

- The material being conveyed is not a metal dust or hybrid mixture
- The connection between equipment is smaller than 4 inches in diameter
- All connected equipment is provided with explosion protection in accordance with 7.1.2.

Add Annex to A.7.1.4.2 as shown below:

A.7.1.4.2 Process equipment, such as mills, spray dryers, dust collectors,
7.1.4.4* Isolation devices shall not be required if a documented risk evaluation determines that the connected equipment has been reduced in accordance with 7.1.2.1(1) or 7.1.2.1(5).

* Rotary valves in accordance with NFPA 69, Standard on Explosion Prevention Systems.

7.1.4.2 Isolation devices shall include, but shall not be limited to, the following:

- Chokes
- Rotary valves in accordance with NFPA 69, Standard on Explosion Prevention Systems.
- Flame front diverters in accordance with NFPA 69, Standard on Explosion Prevention Systems.
- Automatic fast-acting valve systems in accordance with NFPA 69, Standard on Explosion Prevention Systems.
- Chemical isolation systems in accordance with NFPA 69, Standard on Explosion Prevention Systems.

Delete Annex to deleted 7.1.4.2 (1) and (4).

The purpose of a risk assessment is not to determine that an explosion will not occur. The final text for all changes to paragraph 7.1.4 are shown with all changes explained by the references as stated in the substantiation.

Proposal 654-23 (A2010) Backup

654-23 Log #34 Final Action: Accept in Principle in Part (7.1.4)

Submitter: Eredem A. Ural, Loss Prevention Science & Technologies, Inc.

Recommendation: Revise text to read as follows:

7.1.4.2 Isolation devices shall include, but shall not be limited to, the following:

1) Chokes
2) Rotary valves in accordance with NFPA 69, Standard on Explosion Prevention Systems
3) Automatic fast-acting valve systems in accordance with NFPA 69, Standard on Explosion Prevention Systems
4) Flame front diverters in accordance with NFPA 69, Standard on Explosion Prevention Systems
5) Chemical isolation systems in accordance with NFPA 69, Standard on Explosion Prevention Systems

A.7.1.4.2(4) Figure A.7.1.4.2(4) illustrates an example of deflagration propagation using flame front diversion. This device provides relief against pressure build-up, but does not count as an explosion isolation device.

7.1.4.3 Isolation devices shall not be required when oxidant concentration in pieces of equipment and connecting ductwork has been reduced below the inerting concentration or when the dust has been rendered noncombustible in accordance with 7.1.2.1(1) or 7.1.2.1(5).

7.1.4.2(4) Existing paragraph 7.1.4.2 has been further modified to delete (1) chokes as they are not permitted as explosion isolation devices.

With the deletion of (4) on flame front diverters per the recommendation, the annex should also be deleted, so the Committee has rejected the proposed modifications to A.7.1.4.2(4) and has recommended in Proposal 654-25 (Log #41) that this annex item be deleted.

The Committee has accomplished the intent of the submitter in the recommended modification of 7.1.4.3 by moving the existing references to 7.1.2 that address oxidant concentration reduction (1) from the end of this requirement.

The final text for all changes to paragraph 7.1.4 are shown with all changes from related proposals in Proposal 654-25 (Log #41). See Committee action and statement in Proposal 654-25 (Log #41).

Number Eligible to Vote: 28
Ballot Results: Affirmative: 23
Ballot Not Returned: 5 Barton, J., Gillis, J., Hunter, R., Hurst, G., Ness, A.

Proposal 654-26 (A2010) Backup

654-26 Log #40 Final Action: Accept in Principle (7.1.4.4)

Submitter: Thomas C. Schepera, E. I. DuPont de Nemours & Company

Recommendation: Revise text to read as follows:

7.1.4.4 Isolation devices shall not be required if a documented risk evaluation that is acceptable to the authority having jurisdiction determines that the risk of deflagration propagation is acceptable, deflagration propagation will not occur.

Substantiation: The purpose of a risk assessment is not to determine that an event will not occur; rather, the purpose is to determine the appropriate controls necessary to reduce the risk to an acceptable value.

Committee Meeting Action: Accept in Principle

Delete paragraph 7.1.4.4 and the related annex item as shown: 7.1.4.4 Isolation devices shall not be required if a documented risk evaluation that is acceptable to the authority having jurisdiction determines that deflagration propagation will not occur.

7.1.4.4 A.7.1.4.1 See A.7.1.1.1 for an explanation of the considerations in a documented risk evaluation.

Committee Statement: The Committee recommends deleting the existing paragraph 7.1.4.4 as it is redundant with paragraph 7.1.1. This action accomplishes the intent of the submitter. See also Committee Action and Committee Statement in Proposal 654-25 (Log #41).

Number Eligible to Vote: 28
Ballot Results: Affirmative: 23
Ballot Not Returned: 5 Barton, J., Gillis, J., Hunter, R., Hurst, G., Ness, A.
Proposal 654-17 (A2010) Backup

654-17 Log #12  Final Action: Accept in Principle  
(6.1.3)

Submitter: John M. Cholin, J. M. Cholin Consultants Inc.  
Recommendation: Revise text as follows:  
6.1.3 Recycling of Air-Material Separator Exhaust. Cleaned, exhaust air from air material separators shall not be returned back into the facility unless provision are in place to divert the return air flow to the building exterior in the event of a fire in the air-material separator.  
This language is to replace the text of 6.1.3. The text in 6.1.3.1 and 6.1.3.2 is to remain.

Substantiation: The proposed text removes an industrial hygiene requirement that the TC is not qualified to establish and clarifies the intent of the TC.  
Committee Meeting Action: Accept in Principle  
Delete existing 6.1.3.1 and 6.1.3.2 as shown and replace with the following new text:  
6.1.3 Recycling of Air-Material Separator Exhaust. Recycling of air-material separator exhaust to building shall be permitted if the system is designed to prevent both return of dust with an efficiency of 99.9 percent at 10 um and transmission of energy from a fire or explosion to the building.  
6.1.3.1 Recycling of air-material separator exhaust to the building shall not be permitted when combustible gases or vapors or hybrid mixtures are involved.  
6.1.3.2 Recycling of air-material separator exhaust to the building shall not be permitted when the recycled stream reduces the concentration of oxygen below 19.5 percent by volume in the work area.

Proposal 654-5 (A2010) Backup

654-5 Log #CP2  Final Action: Accept  
(3.2.2 and A.3.3.2 Air-Material Separator (AMS) )

Submitter: Technical Committee on Handling and Conveying of Dusts, Vapors, and Gases,  
Recommendation: Revise the existing definition of Air Material Separator as shown:  
3.3.2* Air-Material Separator (AMS). A collector device designed to separate the conveying air from the material being conveyed.  
Delete existing definitions 3.3.2.1 and 3.3.2.2  
Revise existing Annex A.3.3.2 as shown:  
A.3.3.2 Air-Material Separator (AMS). Examples include cyclones, bag filter houses, and electrostatic precipitators, the following:  
Cyclonic Separator (Cyclone) is a device utilizing centrifugal forces and geometric means to separate the conveying air stream from the majority of the conveyed material. The efficiency of this separation is based upon many factors such as geometry of the cyclone, material particle size and density, and air/gas mass flow. Generally, this unit is considered only an initial or primary separator and additional separation devices are applied to meet air pollution control requirements.  
Dust Collector is a device utilizing filter media to separate fine dust particles from the conveying air/gas stream. Such devices often have automatic methods for continuous filter cleaning in order to maintain the operational efficiency of the device. Typically the filter media is either cartridges or bags. The operating pressure of this device is usually limited by its shape and physical construction.  
Filter Receiver is similar to a “dust collector” but designed for higher differential pressure applications.  
Scrubber is a device utilizing geometry, physical barriers and/or absorption methods, along with a fluid (e.g. sprays, streams, etc.) to separate and collect gases and/or dusts.  
Electrostatic Precipitator is a device utilizing differences in electrical charges to remove fine particulates from the air stream.

Final Filter is a high-efficiency device commonly utilizing a pre-filter and secondary filter within an enclosure to provide the last particulate removal step before the air is discharged from the system. Such devices are commonly used when recirculating the air stream to occupied areas. This device can provide protection against the failure of a dust collector or filter receiver upstream of the device. High Efficiency Particulate Aerosol (HEPA) filter is an example.

Substantiation: The Committee has revised the definition of Air-Material Separator to more correctly reflect what devices are included and also provided a more comprehensive explanatory section in the annex to the definition.

Committee Meeting Action: Accept  
Number Eligible to Vote: 28  
Ballot Results: Affirmative: 23  
Ballot Not Returned: 5 Barton, J., Gillis, J., Hunter, R., Hurst, G., Ness, A.

Proposal 654-37 (A2010) Backup

654-37 Log #CP7  Final Action: Accept  
(7.13.1)

Submitter: Technical Committee on Handling and Conveying of Dusts, Vapors, and Gases,  
Recommendation: Revise 7.13.1.1.2 as follows:  
7.13.1.1.1 Where an explosion hazard exists, air-material separators with a volume of 8 ft3 (0.2 m3) or greater shall be located outside of buildings.  
7.13.1.1.2* Air-material separators shall be permitted to be located inside of buildings where one of the following applies:  
(1) Air-material separators are protected in accordance with 7.1.2.4 through 7.1.2.10.  
(2) Air-material separators that meet all of the following criteria:  
(a) They are equipped with deflagration vents that are vented through ducts to the outside.  
(b) The reduced venting efficiency due to the duct has been taken into account.  
(c) The ducts are designed to withstand the effects of the deflagration.  
(2)* Air-material separators that have a volume of less than 8 ft3 (0.2 m3)  
Substantiation: The deleted text in this section is not necessary as NFPA 68 has been included by reference in section 7.1.2.1(2) through other action by the Committee. In the current edition of NFPA 68 is included in the annex because it was a guideline document at the time the current edition was written. Now that it is a standard, it can be referenced in the body of the text. NFPA 68 provides requirements for vent ducts, and so it would be redundant to provide those requirements here. By removing the vent duct requirements from 7.13.1.1.2, the requirements in this section would become identical to section 7.1.2. 
See also Proposal 654-38 (Log #6) for the revision pertaining to the volume specification limit of 8 ft3 or greater for the air-material separator.  
Committee Meeting Action: Accept
Proposel 654-38 (A2010) Backup

654-38 Log #6 Final Action: Accept in Principle

(7.13.1.1.2)

Submitter: Bill Stevenson, CV Technology, Inc.

Recommendation: Add new text as follows:

7.13.1.1.1 Where an explosion hazard exists, air-material separators larger than 8 ft³ shall be located outside of buildings.

Substantiation: The exemption for air-separators that have a volume of less than 8 ft³ from the need for protection is not entirely clear to all users of the current edition of the document.

Committee Meeting Action: Accept in Principle

Add new text as follows:

7.13.1.1.1 Where an explosion hazard exists, air-material separators with a volume of 8 ft³ or greater shall be located outside of buildings.

Committee Statement: The Committee made an editorial change to ensure that the volume limit was applied correctly by clarifying that the volume was 8 cubic feet or greater and not just greater than 8 cubic feet.

Number Eligible to Vote: 28

Ballot Results: Affirmative: 22 Negative: 1

Ballot Not Returned: 5 Barton, J., Gillis, J., Hunter, R., Hurst, G., Ness, A.

URAL, E.: There is no scientific justification for the 8 ft³ rule of thumb. The correct number depends on the details of the equipment design, process, pressure resistance and how close the people or walls come to it. The correct number can be determined by consequence analysis or by performance based design.
WALTER FRANK: No. Actually, if I may suggest,
654-6 is still -- I'm sorry.

SHANE CLARY: Okay. Mr. Francis.

WALTER FRANK: The motion to send all of 61 back --

SHANE CLARY: Mr. Frank, please -- please suspend.

Mr. Francis, just so we can clarify, is it your intent that you wish at this point to eventually get to your motion 654-9 and not to pursue your other motions at this time?

SAM FRANCIS: Yes.

SHANE CLARY: And Mr. Cholin, on your motions...

JOHN CHOLIN: Mr. Chair, I would like that we table my motions until we consider the motion to return the entire document to committee.

SHANE CLARY: Okay. Thank you.

Okay. The chair's call that at this point we are going to immediately go to Motion 654-9 which is to return the entire document to the committee.

So Mr. Francis, that was your motion?

SAM FRANCIS: That's correct, sir. Do I need to make it again?

SHANE CLARY: Yeah. You need to officially
make it. I can't make it for you.

SAM FRANCIS: Sam Francis, American Wood Council, moving -- making the motion to return the report to the committee.

(Second.) ^

SHANE CLARY: Okay. We have a second. So everyone is clear, we are coming to microphones now, you are discussing to return the whole document to the committee or your reasons for opposing this at this time.

And if that -- and depending on the vote of the motion, if the motion before us is successful, then basically we are done with our discussions today on 654. However, if the motion is not successful, you will then be returning to the motions which are on the docket.

Mr. Francis, please proceed.

SAM FRANCIS: The new section, 6.1, and the equations that we discussed, the determination of risk is the heart of this document. The rest of it is what you do after you determine that you have a risk. And in my Comment 654-34, which isn't a part of this, we're suspending that to discuss sending the whole thing back. I pointed out that references to these equations and their ramifications spread throughout the document.

Once we send back the equations and that sort
of thing, the entire document should go back with it to be refined and correlated so that when it comes back to us, the -- the solutions that we have to mitigate risk match how we determine risk and so forth.

And by the way, I would reiterate now that no one in all of this debate has offered a single shred of evidence that the existing document has failed, so we're not fixing a problem. Therefore, there's no urgency in bringing the document forward.

The committee's got time to go back and work the equations, the Chapter 5 performance section, and the prescriptive determinations. There's time to do this.

In fact, it's working quite well as is so we're losing nothing and gaining a great deal because as each of the supporters of previous motions have pointed out to you, there's -- there's merit in this intellectual exercise. This isn't worthless.

The question is: Is it necessary to replace the prescriptive? Can enforcers enforce with it? Having sent back those important parts, send the whole thing back and let it come back to us as a workable meaningful document. That's my motion.

SHANE CLARY: Okay. Thank you.

Mr. Frank.
WALTER FRANK: I guess we need to clarify something here. In approving the earlier motion to send all of 61 back, the debate focused on the equations. There's actually content in 61 that is totally unrelated to the application in the equations, and that's the focus of some of these other motions.

If we needily leap to -- well, let's -- having decided to send the equations back for further consideration, let's go ahead and rush and decide to send the whole document back. We'll be sending back some issues that have not been discussed here. The committee will not have had any guidance on how to address some of these other non-equation related issues associated with non-equation content in 6.1, and it's going to bring me a rock -- exercise and bring me a rock.

So I am concerned that immediately going to let's send the whole document back, is going to send the document back without giving the committee guidance on how to address these non-equation issues that were the subject of other motions that we're going to be presenting tonight.

SHANE CLARY: Okay. Thank you.

Microphone No. 2.

MARCELO HIRSCHLER: Marcelo Hirschler GBH
International clarification again. We're still talking about Section 6.1. Can you please clarify for us, the motion that we passed, didn't that return all of 6.1 so anything in 6.1 is gone? There's no need for further discussion; is that correct?

SHANE CLARY: 6.1, it goes back to what the existing tech says whatever that may have been. If there was no existing 6.1, at the present time 6.1 is not there.

MARCELO HIRSCHLER: Thank you.

SHANE CLARY: You're welcome.

At this time we'll proceed with any further discussion on 654-9 which is to return the entire document. Seeing I will proceed to the vote.

Mr. Frank, do you have any final comments?

WALTER FRANK: No.

SHANE CLARY: Okay. With that, all in -- I'm sorry.

Microphone No. 1, Mr. Cholin.

JOHN CHOLIN: Yes, Mr. Chairman. My name is John Cholin from JM Cholin Consultants. There is an enormous amount of value in the work that has been done by the TC to get the proposed version this far. We won't be losing that work.

SHANE CLARY: And are you in favor or against
the motion.

JOHN CHOLIN: I'm in favor of the motion to return. I apologize. I'm in favor of the motion to return the document. We won't lose that work. We'll use what we have right now as a starting point and fix the remaining outstanding issues as Mr. Francis noted. I don't know that anybody dealing with deflagrations and explosions can identify a loss where the event occurred in spite of conforming with our current edition of the document.

In every event that I've investigated, the event would have been prevented had we just complied with the current edition of the document. Thank you.

SHANE CLARY: Okay. Thank you.

Seeing no -- okay. Be ready at the mics here.

Okay. Microphone No. 2.

ERDOM URAL: You want phone number?

SHANE CLARY: Say again.

ERDOM URAL: I thought you said phone number.

SHANE CLARY: No. No. I'm sorry. No. I'll get that later.

ERDOM URAL: Erdom Ural speaking for myself and against the NITMAM.

Mr. Francis said why change the document since there are no problems with the 2006 edition. I thought
we -- NFPA has a policy of looking at the documents affirming or making improvements continually, not because there is a problem with the -- with the -- problem identified.

If there is a problem identified with the document -- in fact, NFPA has other avenues such as doing a TIA, formal interpretation, so there's these two equations or four simple equations for only a small part of a great amount of work, a great amount of talk that went into consideration when the new edition was developed. So why delay publishing that information?

Why delay requiring people to comply with that information just because there are nothing wrong identified with the document. Maybe there is. So that's why I request this body to fail the NITMAM and vote against the motion.

SHANE CLARY: Okay. Thank you.

Further discussion?

Mr. Frank.

WALTER FRANK: I do feel I need to respond.

There's been several times the statement has been made no facility that complied with the current version of 654 has had an incident. Other than a few pharmaceutical facilities, I've never been in a facility who conformed with the current 654.
So, you know, going into a facility that's blown up and seeing some residual dust and saying well, this facility obviously didn't comply to 654 is not the same -- that's not proof of the assertion that has been made that no facility has ever blown up that conformed to 654. Forgive me. It's a point I had to make.

Most industries are so far away from complying with 654 that we've got a long way to go, and it's the committee's intent that this revision would help people move in that right direction. And hopefully when we get a chance to work on it again, we'll still head in that direction. Thank you.

SHANE CLARY: Okay. Thank you.

At this time we'll proceed to the vote. Again, it's to return the entire report to the committee. All in favor of the motion, please signify by raising your hands.

(Raising Hands.)

SHANE CLARY: Thank you.

All opposed?

(Raising Hands.)

SHANE CLARY: And the motion carries.

Thank you, Mr. Frank.

And at this time we'll be taking a ten-minute comfort break, a ten-minute comfort break. Thank you.
Subject: FW: NFPA 654 Document Processing

From: Beach, Denise
Sent: Thursday, July 15, 2010 1:27 PM
To: Cronin, Amy; Fuller, Linda; Colonna, Guy
Cc: wlf@FrankRisk.com
Subject: NFPA 654 Document Processing

Dear Amy, Linda and Guy,

In the HAP-AAA meeting yesterday, the committee discussed the options allowed by the Regulations Governing Committee Projects for Further Processing of Documents That Have Been Returned to Committee. In the event that the Standards Council returns the entire report as indicated in the 2010 Technical Session, the HAP-AAA committee preference is to enter NFPA 654 into the 2012 Annual Cycle, invoking section 4.7.3(c): “Process the document through a full revision cycle without a call for new public proposals. This requires the TC to reconsider and act on all public proposals previously filed, generate any new TC proposals, and publish and prepare an amended Report on Proposals, followed by the processing of the new Report on Comments.”

To this end, the committee selected tentative meeting dates to start the ROP reprocessing: November 15-17, 2010, with a backup or overflow date of December 13-15, 2010.

Please let me know if you need any further information from me.

Best Regards,

Denise

Denise Beach
Senior Engineer
NFPA
1 Batterymarch Park
Quincy, MA 02169-7471
Phone: 617-984-7501
Fax: 617-984-7110
Appeal of Actions Taken at the June 9, 2010 NFPA Technical Meeting Regarding NFPA 654

June 29, 2010

Filed by:

Walter Frank, P.E.
Frank Risk Solutions, Inc.
1110 Shallcross Ave
Wilmington, DE 19806
302-521-7588

Action being appealed:

I am appealing the action taken at the 6/9/10 NFPA Technical Meeting, which passed motion 654-9.

Grounds for the appeal:

I am the chair of the Technical Committee on Handling and Conveying of Dusts, Vapors, and Gases, the TC responsible for NFPA 654.

While I am filing this appeal on my own behalf, I do so out of respect for the dedicated effort devoted by over 25 industry experts as they labored for the last two years to update NFPA 654. It should be noted that the TC voted in overwhelming support of the revised standard draft presented at the June 9, 2010 Technical Meeting.

I am appealing the decision to pass motion 654-9. I do so because I believe the vote taken at the Technical meeting did not adequately consider the technical merits of the issues underlying the motion and the changes that it sought to prevent being made to NFPA 654. I further believe that the standard presented on behalf of the TC provides significant advances in the control of combustible dust hazards and that industry would be disadvantaged by delays in issuing the revised version of NFPA 654.

As technical substantiation, I am attaching the statement that I filed today with my ballot on the NFPA 654 Amendment to Return Entire Report. I also cite my rebuttal of all of the motions presented at the Technical Meeting, as documented on pages 46 through 98 of the transcripts of the June 9, 2010 meeting. I am including my rebuttal of motions 654-1 and 654-3, as they served as the predicate for the Motioner to justify motion 654-9.

In summary, the Motioner sought to return the entire standard to the TC for reconsideration.
The TC worked two years to address some very difficult technical issues that served as the basis for the proposed revision to 654. The value of this effort was negated based upon unsupported and technically inaccurate claims made by the Motioner and his supporters during the Technical Meeting. I believe that the attachment, and the minutes of the Meeting, will demonstrate that the TC has proposed technically sound, substantive enhancements to the document, and that NFPA 654 should be moved forward to enhance the safety of facilities handling combustible dust.

While I am sure the TC could further improve 654, I still believe that the TC has made major improvements in the document. I am proud enough of our work to believe that workers and companies would be better protected if our version of 654 were released. Regrettably, that release may now be delayed. So, in addition to the technical substantiation, I would like to add that I am gravely concerned that needless fatalities will result as a consequence of such a delay.

**Relief requested:**

I request that the Standard Council overrule the action taken at the June 9, 2010 Technical Meeting; i.e., overrule the approval of motion 654-9 and affirm the actions of the TC.

W. L. Frank, P.E.
I am voting “Do Not Agree” for the reasons described below.

As I previously shared with the Technical Committee (TC), I am deeply saddened and frustrated by the actions taken at the Technical Meeting in Las Vegas. While I am sure we could further improve 654, I still believe that the TC has made major improvements in the document. I am proud enough of our work to believe that workers and companies would be better protected if our version of 654 were released. Regrettably, that release may now be delayed. I am gravely concerned that needless fatalities will result as a consequence of such a delay. That is an overarching reason for my “Do Not Agree” vote.

I want to be clear that I support the NITMAM process. It provides a valuable mechanism for those having divergent opinions to get their message heard. I was, however, quite surprised and dismayed by how the process was implemented at the NFPA Technical Meeting in Las Vegas. I do not feel that our product – which the TC labored over for two years – received a balanced hearing, based upon a sound, factual analysis. Bluntly put, facts did not seem to matter in the debate or in the decisions at the Technical Meeting. More bluntly, incessant repetition of incorrect or unsubstantiated statements and orotund hyperbole trumped fact and reality far too often.

I am using this substantiation statement to address some of the points raised against the draft NFPA 654 standard at the Technical Meeting and to reiterate the responses provided by those TC members who were present to speak in defense of the standard draft. It is my hope that others will add similar comments in the substantiations submitted with their ballots.

Three motions were voted on at the Technical Meeting and each was passed. While only the third motion, to return the entire standard to the TC, is the subject of this ballot, I also address some of the issues raised in the first two motions, as they served as predicates for the final motion.

1) Use of the term “deflagration” and “dust flash fire”: The TC voted overwhelmingly in support of the usage that we settled upon for these terms. Those speaking against the 654 draft contended that our use of the terms “deflagration” and “dust flash fire” were inconsistent with standard NFPA usage and that “deflagration” should be used in place of “dust flash fire.”

NFPA 68 (Standard on Explosion Protection by Deflagration Venting, the document which “owns” the term “deflagration”) defines a deflagration as:

“Propagation of a combustion zone at a velocity that is less than the speed of sound in the unreacted medium.”

This definition is consistent with the usage in the SFPE Handbook of Fire Protection Engineering, the NFPA Fire Protection Handbook, and other industry publications such as those of the American Institute of Chemical Engineers, Center for Chemical Process Safety. NFPA 1, Fire Code refers to the NFPA 68 definition. The TC believes that our
usage of the term “deflagration” is consistent with its usage in NFPA 68, and these other NFPA and industry references.

NFPA 654 must address three types of combustion hazards: fires in settled layers of dust; flash fires in suspended dust clouds; and explosions that can result when such burning dust clouds are confined in a way that allows pressure to build up. All three of these combustion events are deflagrations, consistent with the use of the term as defined by NFPA. Consequently, the TC elected to use the term “deflagration” as a more generic term to address the entire class of combustion events, while using more specific terms to focus on the different modes of combustion, and to more effectively communicate the severity of the consequences associated with the particular events.

Of particular importance in the revised standard was the need to draw the distinction between:

1. Situations involving rapidly burning and expanding combustible dust clouds where the consequence of concern is that personnel can be engulfed in, and injured by, thermal exposures from the resulting fireball, and

2. Situations where such burning dust clouds are confined in a way that pressure can build to levels that can damage enclosures, including rooms, and personnel can be injured by the physical damage that results when the enclosure bursts.

The TC, consistent with normal usage of the terms, elected to refer to the first event as a “dust flash fire” and the second as an “explosion.”

The Motioner contended that the term “dust flash fire” did not adequately communicate the gravity of the event and proposed that the term “deflagration” should be used instead. To do so, in the opinion of the TC, would risk confusion between the two phenomena: dust flash fires (which the Motioner wants to call “deflagrations”) and explosions (which are also deflagrations). Contrary to the Motioner’s contention, the TC actually felt that the term “dust flash fire” was more evocative of the nature, and the acute severity of the potential consequences, of the event than the more general (and more drily “scientific”) term of “deflagration.”

Note that the NFPA 68 Committee also thought most people did not appreciate the severity of the term deflagration. That is why the title of NFPA 68 was changed to include the word “explosion” in the 2007 edition. In other words, the Committee qualified the phrase "Venting of Deflagrations" in the title by changing it to "Explosion Protection by Deflagration Venting" in the 2007 edition.

All of the above was communicated during the Technical Meeting, along with the fact that the TC overwhelmingly believed that “dust flash fire” was the better, and more communicative, term to use to imbue the distinction between the two events (fireballs and overpressure events) in the minds of the users of the standard.
The Motioner also contended that the term “dust flash fire” was not in common usage within NFPA publications. As communicated during the Technical Meeting, there is adequate precedent within NFPA publications for the use of the term “dust flash fire.”

- NFPA 921 defines “flash fire” to include dust as a fuel.
- NFPA 2112 and 2113 use the NFPA 921 definition of “flash fire” – and the scope statements of the documents specifically refer to “dust flash fires.”
- NFPA 1951 uses the NFPA 921 definition of “flash fire.”
- NFPA 1991 refers to “dust or particulate flash fires.”
- NFPA 484 makes the distinction between the hazards associated with flash fires and explosions involving dust.
- NFPA 704 discusses flash fires from burning dust clouds.

In summary, the TC – through its overwhelming support of the proposed terminology – did not believe that the alternate use of terminology proposed by the Motioner was consistent with general usage of the terms, within and beyond NFPA publications, and did not adequately communicate the gravity of the events sought to be described.

2) Technical basis for the paragraph 6.1 equations: A common complaint was that there was no technical substantiation for the equations in paragraph 6.1. It was repeatedly pointed out by NFPA 654 supporters during the Technical Meeting debate that this assertion was not factually accurate.

For example, supporters of the 654 draft pointed out that the explosion equations were based upon the partial volume venting methodology upon which NFPA 68 is based. Every time this was explained, someone else in the opposition stood up and repeated “There is no technical basis for the equations.” I even pointed out that a vote against our equations would imply that the technology underlying NFPA 68 was not valid.

As to the flash fire equations, it was repeatedly pointed out by the supporters of the NFPA 654 draft that the flash fire equations are derived directly from the laws of thermodynamics and the ideal gas law. Certainly, the technical validity of these laws should not be in dispute at this time.

The Committee believes that the technical bases for the equations are adequately addressed in Annexes A and D of NFPA 654, and in NFPA 68. Their usage and bases were documented in the NFPA 654 ROC report. Furthermore, these equations have been subject to public review via other mechanisms, such as a technical paper presented at the 2010 Loss Prevention Symposium of the American Institute of Chemical Engineers.

3) Our equations are too difficult to use: This was an oft-repeated comment; even though I pointed out that the simple equations could be applied by anyone who could calculate the floor area of a room. NFPA 654 supporters repeatedly pointed out that the simple equations were available, and that the full (more complex) equations only needed to be used when someone could not tolerate the more conservative results from the simple
equations. Each time we did so, someone else stood and just reiterated something to the effect of: “But… they’re too hard.” In the end, hyperbole trumped fact.

While the protestors continued to point to the existing 1/32 inch thickness criterion (in the 2006 edition of NFPA 654) as a simpler alternative to the equations, this criterion – as was pointed out during the meeting – is not straightforward and simple to use when it is applied correctly, as described in the annex to the 2006 edition of 654. Dust layer depths in excess of the thickness criterion are intended to be limited to an area of no more than 5% of the floor area (or an equivalent area of overhead surfaces). Thus, the user still has to be capable of calculating the area of the room. Furthermore, the current 654 provides no guidance on how to assess the significance of varying depths of the dust layer. The thickness criterion requires the measurement of relatively thin layers of dust, a task that is often difficult to do, particularly for areas that are remote and difficult to reach. It can also require a knowledge of the density of the dust layer – again, a difficult to obtain parameter.

Experience has shown that both facility operators and regulators have interpreted and applied the existing thickness criterion in a variety of incorrect fashions.

In addition, it is not the thickness of the dust layer but, rather, the mass of the dust present that determines the damage potential of the dust accumulation. It is the TC’s belief that the existing dust layer thickness criterion provides a poor means of monitoring the mass of dust present in the facility and projecting its injury/damage potential.

It was suggested by the protestors that it would be necessary to remove dust from the facility and weigh it to demonstrate compliance with the mass-based equations. Well, in reality, dust accumulations do need to be removed from the facility on a periodic basis anyway – this is called “housekeeping,” and serves to ensure that dangerous amounts of dust are not present in the facility. Since the dust must be removed periodically anyway, what is wrong with weighing the dust removed and using this information to establish dust accumulation rates and required cleaning frequencies? It is far easier to vacuum dust from elevated surfaces than it is to measure the thickness of the dust on such surfaces… and more conducive to enhancing the safety of the facility.

One TC member is establishing a company-wide program to do this, and is doing so successfully. He is demonstrating the workability of the concepts embodied in, and required to implement, the mass-control-based approach underlying the equations in the draft version of 654. Furthermore, this effort is an off-shoot of a settlement agreement in which OSHA agreed with the concept. It is my understanding that the TC member will include a description of his approach, and successes, in the substantiation filed with his ballot.

Finally, and to reiterate, it is my belief that a preference for the existing thickness criterion is too often based upon a failure to understand how to correctly apply this criterion.
4) Our equations treat all dusts alike: I cannot remember a statement that was more patently false, or more readily accepted by the voting members. Even though the NFPA 654 supporters pointed out that the existing 1/32 inch depth layer criterion (apart from the density adjustment), treats all dusts alike, we were repeatedly met with claims that the equation approach was unique in being a “one-size-fits-all” methodology that did not account for heat of combustion and other dust-specific parameters. I pointed out that the 1/32 inch criterion similarly did not account for dust-specific parameters and that the only equations that did were the more complex, alternative equations provided in the 654 draft.

To be clear – the existing dust layer depth criterion is a “one-size-fits-all” methodology. Only the new, equation-based approach provides the option to reflect the actual characteristics of the dusts and the strength of the building when determining how much dust is required to exceed the thresholds for facility damage and personnel harm.

The protesters were absolutely incorrect in asserting to the membership that the equations are the “one-size-fits-all” alternative. Anyone who truly understood the equations would understand this point. Unfortunately, it appears that some of those who were denigrating the equations were apparently not seeking to first understand them.

5) No standardized method exists for estimating the entrainment fraction: Many protested the assumed value of 0.25 for the entrainment fraction used in the dust mass threshold equations and the fact that there currently is no standardized method for estimating it. The assertion was, commonly, that the equations are invalid without firm, final guidance for determining an appropriate entrainment fraction.

It is agreed that the work remains to provide better guidance for estimating entrainment fractions, and a research project is underway at this time to provide the foundation for this. The TC elected to propose a value of 0.25 until more quantitative guidance is available.

As pointed out in the Technical Meeting, the existing 1/32 inch thickness criterion inherently includes an implicit consideration of entrainment fraction. Annex D of the 2006 edition points out that not all dust is likely to be suspended into the cloud. Further, calculations have shown that, for credible situations, untenable overpressures and fireball volumes could be attained if the entire 1/32 in thick layer (over 5% of the floor area) was suspended into the burning dust cloud.

In other words, the current criterion – which the protestors fervently sought to retain – only yield tolerable results if it is assumed (as discussed in Annex D) that only a fraction of the dust is likely to be entrained.

Clearly, the entrainment fraction must be between 0.0 and 1.0, and historical records of explosions would indicate that it is not likely to be near to either of the endpoint values of the range. The 0.25 default value was selected by the TC to yield results from the explosion overpressure calculation that would match what would have been obtained
using the existing 1/32 inch thickness criterion, for some typical values of the other variables in the equation. It was the TC’s judgment that the 0.25 value provided appropriate conservatism for the interim until a better methodology for estimating the entrainment fraction can be produced.

In conclusion, the equation approach prompts the explicit consideration of entrainment fraction – a physical reality that is obscured by the existing 1/32 inch thickness criterion. The approach contained in the revised NFPA 654 makes obvious the role of the entrainment fraction in the results of the calculations. It provides the basis for a more rigorous treatment of the topic as ongoing research yields a more quantitative basis for selecting the entrainment factor.

It is anticipated that other TC members will provide additional detail on this point in the substantiation of their ballots.

6) The existing 1/32 inch thickness criterion addresses all needed situations: The protestors repeated indicated, either explicitly or implicitly, that the 1/32 inch thickness criterion comprehensively addressed the needs for determining where dust fire and explosion hazards exist. In reality, the scope of application for this criterion in the 2006 edition of NFPA 654 is far more limited than the protestors seem to believe. Paragraph 6.2.3.1 of the 2006 edition of NFPA 654 limits the application of the criterion to determining the extent of the fire or dust explosion hazardous area specifically when separation is used to limit this area:

“When separation is used to limit the fire or dust explosion hazardous area, the hazardous area shall include areas where dust accumulations exceed 1/32 in. (0.8 mm) or areas where dust clouds of a hazardous concentration exist…”

Thus, the protestors’ intent to use the criterion in a general fashion (for example, where safety is based upon segregation or detachment) is not a use that is authorized by the current edition of 654. Further, as recent work has shown, a single criterion to define both fire (dust flash fire) and overpressure (explosion) hazard areas is not feasible or appropriate.

7) There is no basis for the 0.05 fireball exposure probability in the dust flash fire equations: The equations for determining the dust flash fire mass threshold assume that 5% of the room (up to a height of 2 meters) would be filled by the fireball resulting from the entrainment of the dust (after applying the entrainment factor). The protestors questioned the validity of this assumption by the TC.

The 2006 edition of NFPA 654 contains a life safety objective to “protect occupants not in the immediate proximity of the ignition from the effects of fire, deflagration, and explosion…” (emphasis added). However, NFPA 654 has not previously addressed what “in the immediate proximity of the ignition” means. The 0.05 factor in the flash fire equations in 6.1 defines a fraction (5%) of the room volume (from floor level up to an elevation of 2 m) that might be filled with the fireball from the flash fire.
In effect, the 0.05 factor provides a quantitative perspective on what in the immediate proximity means. If the user feels the 0.05 factor is not sufficiently conservative, the results of the calculation can be proportioned downwards as the user sees fit. Annex A describes the significance of the 0.05 factor.

The TC did not feel that a value higher than 5% was appropriate.

8) Equations do not define hazard areas within equipment: In identifying the gaps in the section 6.1 equations, and in touting the benefits of the existing thickness criterion, protestors asserted that the equations only apply to building volumes and do not identify where hazards exist inside of equipment. Granted, they were not intended to do so. Neither, however, was the existing thickness criterion intended to do so. It, too, only addresses the identification of hazard areas inside building volumes. This was pointed out, and ignored, during the debate in the Technical Meeting. The TC believes that the identification of hazardous conditions within equipment, for example, is already adequately addressed by the standard.

9) There is no loss history to justify making the standard more stringent: This is, perhaps, the most distressing assertion coming from the Technical Meeting. Expressed another way, it could be stated that “the body count tally is not high enough yet to warrant providing more stringent requirements for the control of dust in the work environment.” There is clearly an industry loss history that illustrates the severity of the dust fire/explosion issue in the US:

- The US Chemical Safety and Hazard Investigation Board (CSB) identified 281 combustible dust incidents between 1980 and 2005 that killed 119 workers and injured 718 others
- OSHA identified 422 dust explosions between 1980 to 2008
- Significant incidents where inadequate housekeeping contributed to the severity of the incident include: Imperial Sugar, West Pharmaceuticals, CTA Acoustics, Hayes Lemmerz, Rouse Polymeric, Jahn Foundry, Malden Mills, and Ford River Rouge
- Since the forest product industry led the fight to return NFPA 654 to the TC, it is worth noting that over 7% of the dust explosion losses reported by FM Global in data sheet 7-76 involved paper dust. (Nearly 39% of the losses were associated with the woodworking industry, but that falls under the scope of NFPA 664).

As to the assertion made by several protestors that no facility in compliance with NFPA 654 has had a dust explosion, I suggest that this is the sort of statement that can be made with the greatest confidence that it can never be proven right or wrong – it just sounds good to whomever makes it, and to whomever accepts it without critical analysis.
I, personally, have never been in a dust-handling facility that complied with the existing requirements of NFPA 654 (with the possible exception of a few pharmaceutical facilities). Unfortunately, there is no roster maintained of which facilities do, or do not, comply with the housekeeping requirements in NFPA 654. However, the data coming out of the OSHA national emphasis program (NEP) for dust hazards indicate that poor housekeeping (i.e., excessive dust accumulations) is a common problem in dust handling facilities.

The TC believes that providing a more definitive means for determining “how dirty is too dirty” will assist both facility personnel and regulators in ensuring cleaner, safer facility operations.

Catastrophic dust fires and explosions are, fortunately, relative rare… but, unfortunately, they impose tragic human and business costs when they do occur. It is likely that the CSB and OSHA statistics cited above far underestimate the frequency of dust fires or explosions which, perhaps due more to luck than skill, failed to propagate to catastrophic, and media-attention garnering, proportions.

The assertion that no facility in compliance with NFPA 654 has had a dust explosion could just as easily, and just as inappropriately, be used to justify loosening the requirements in NFPA 654 to allow even greater dust accumulations, so long as the conceptual threshold body count criterion is not exceeded.

10) Other issues/concerns coming out of the Technical Meeting: There were a number of issues described in other NITMAMs that were not addressed in the Technical Meeting. These matters, addressing other technical content in the draft standard, were unrelated to the issue of the mass threshold equations.

When the protestors saw that they were going to achieve their primary objective – preventing the NFPA 654 draft from moving forward – these other issues were dropped. As a consequence, if the standard is returned to the TC, we will not have received the benefit of having seen these other issues addressed, and hopefully resolved, during the Technical Meeting.

However, these issues will remain as potential stumbling blocks that can be thrown in the path of the TC the next time we return a version of the standard to the Technical Meeting. This “Bring me another rock, as long as it is a different rock” approach will not help the TC in its efforts to produce a document which fosters improved safety in dust-handling facilities.

W. L. Frank
TC Chair
1. Name: Stan Lancey

Affiliation: American Forest and Paper Association (AF&PA)

Address: 1111 19th Street NW
Suite 800
Washington, DC 20036

2. This action relates to “Motion Sequence Number 654-9” submitted by Sam Francis, AF&PA with Certified Amending Motion to “Return Entire Report” back to committee.

3. Argument setting forth grounds for appeal:

In support of the motion to return the entire NFPA 654 report back to committee for rework the following issues with the current equations and methodology for determining a dust hazard area are addressed:

- Issues with the two simple equations and components required by and contained in the two complex equations
- Practicality or lack of practicality for the users and regulators
- Lack of loss history to support the dust allowance methods proposed.

While AF&PA has reason to believe that two (6.1.3* and 6.1.4*) of the four equations in 6.1.2.1, 6.1.2.2, 6.1.3* and 6.1.4* may show promise (especially if the entrainment fraction methodology is validated at a future date), there is no database from field trials of the proposed methodology or evaluation of loss history data comparing the old and the new methods to show risk reduction benefits commensurate with the greater complexity and cost of the new method to industry. The method has not been studied in sufficient detail, substantiated or validated from a statistical standpoint to show it is any better at risk reduction than the current settled bulk density method contained in the 2006 edition. The more complex methodology has not been refined based on actual trial use in several different industries to ensure it is understandable by the manufacturing plant populations that would have to use it. There has also been no cost analysis performed with the proposed methodology as compared to the existing methodology to establish cost impact to industry, large or small.

Dust layer thickness supported by settled bulk density is a more intuitive and understandable method that can be more practically implemented to get the broadest reapplication and risk reduction benefits. Accordingly, there is no demonstrated basis for adopting these equations at this time. If the technical supporting data thought to justify these equations is later developed, another round of public comment would then be necessary to give interested parties sufficient time to consider the validity of the assertion that the data is adequate to validate the equations.

Furthermore, even if the equations were scientifically validated, there is no loss history...
at present that substantiates the need for new, “theoretical”, more conservative equations. No loss history data has been presented that implies that the previous settled bulk density equation contained in NFPA 654 (2006 Edition), Section 6.2.3.2, is not appropriate and has not served industry in reducing the risk of combustible dust deflagrations and explosions.

Furthermore, even if loss history existed with the present 2006 edition equation, the value(s) of the entrainment fraction(s), which is critical to the use of Section 6.1.3*, and 6.1.4* equations, has not been validated. NFPA has acknowledged that there is no technical basis for the entrainment value, \( \eta_D \), in Section 6.1.5 in stating that it is a “random” number. The use of the term “random” by NFPA, was used in the official solicitation for research funds to establish a methodology. That is the stated reason for the proposed research project on this topic. NFPA has solicited funding and subsequently successfully funded a research project that would perform a study designed to assess whether an appropriate value for the entrainment factor can be determined and, if so, to determine that value (or values) for different dusts. This study has not been completed and its results shared for a broader review.

Additionally, a methodology for substantiating the value (or values) of the entrainment fraction has not been developed or accepted by any recognized national standards organizations. There is currently no available data (which is the only data that may be considered) to support the use of a single entrainment factor (default value of 0.25) for all dusts. Nor is there any nationally recognized test method for quantifying the entrainment fraction, \( \eta_D \), for a given dust sample. Consequently, the user is unable to determine if the “default value” of 0.25 for \( \eta_D \) is appropriate for her/his dust situation from a risk perspective. The committee itself stated in a Committee Statement in responding to ROC Proposal Comment 654-14 that “The Committee recognizes that establishing a single value (for entrainment fraction) may not cover all situations and acknowledges that research is underway to clarify this criteria.” Realistically, a valid and approved methodology for determining entrainment fractions required for use of the equations for all dust types is minimally years away.

If empirically determined values are to be used and relied on, the basis for determining those values must be publicly disclosed to provide the transparency required of standards development by consensus organizations. Furthermore, given the fact that the new equations in Sections 6.1.2.1, 6.1.2.2, 6.1.3* and 6.1.4* do not take feasibility into consideration, it would be inappropriate to utilize these equations to derive a lower value for the dust mass than is calculated using the 2006 edition dust thickness based on settled bulk density equations in Section 6.2.3.2.

In addition to the lack of substantiation, the simple fire equation presented in paragraph 6.1.2.2 represents a 40% reduction in total dust mass from the previous settled bulk density equation, for example, for a material (e.g. tissue paper) with a settled bulk density of 2 lbs/ft³ (~ 1 kg/m³). What is the basis for such a reduction in dust allowance? Loss history does not support this overly conservative reduction.
Additionally, the two “simple” equations presented in Sections 6.1.2.1 and 6.1.2.2 do not take into consideration the type of dust or the combustion energy of particular dusts from a risk perspective. It lumps all dusts (for example: powder river basin coal, polyethylene, urea-formaldehyde, phenolic resin, epoxy resin, paper, starch, etc.) into one category based on a simple but conservative 0.02 multiplication factor times the floor area to establish allowable mass. This leads one to believe that all combustible dusts (those with a Kst of 290 and those with a Kst of 20 are equal from a deflagration or explosion risk perspective which is far from accurate. The mass allowance in a building or a process area for these two Kst dusts (Kst = 290 & Kst = 20) would be the same but the risk of deflagration and explosion is completely different.

The conservative approach provided by the two simple equations penalizes facilities with less energetic, less-deflagrable dusts (e.g. paper) as opposed to more energetic, more-deflagrable dusts (powder river basin coal; some epoxide and phenolic resins; some starches, etc.) by establishing a “one size (i.e. mass) fits all “conservative” approach” based strictly on the floor area of a building or process area with no consideration of relative risks between different combustible dusts. This one-size fits all approach is not warranted for the user community that has a variety of combustible dusts many with substantially different risk profiles from a deflagration and explosion perspective.

Additionally, the two new “complex” equations in proposed Sections 6.1.3* and 6.1.4* (explosion and fire protection) are too complex for most general industry employers and the numerous facilities that do not have intellectual infrastructure in place (i.e. have only non-engineering personnel present or available). It is not a matter of understanding algebra to use the equations, it is a matter of understanding the components required by the equations (i.e. dynamic load factor, entrainment fraction, Cw, etc.) and how to select and apply them. Additionally, to use the more complex equations presented in paragraphs 6.1.3* and 6.1.4* each facility would need to have its dust tested for explosivity parameters to obtain Cw and Pmax data in order to use the equations. The estimated cost for such tests is $2,000 per sample. This $2000 test cost would reoccur for each dust present in each building or process area.

Many small industrial facilities would be substantially burdened by the cost and the need to hire outside consultants to obtain this data, obtain laboratory test data, and apply the equations and establish the structure/building and personnel/fire dust mass thresholds. The present dust thickness equations are easily understood and applied by industry and regulators alike and do not present unnecessary and excessive cost burden to the user. Additionally, there is no loss history to suggest that when the 2006 edition’s settled bulk density equation is applied and used, that it do not protect industry and the public.

**Practicality**

Furthermore, the practicality of using these equations has not been appropriately considered, addressed and will further burden industry. After the industrial user establishes the allowable mass under any of the four new equations, the user has to determine if the area or building’s combustible dust mass has been exceeded. The only
way to accurately establish if the area or building exceeds the established allowable combustible dust mass derived from the equations is to vacuum all the dust in the area or building using dust ignition proof vacuum systems including all ledges and overhead structures (beams, lights, cable trays, ductwork, pipes, etc), bag the dust, and weigh the dust. Then the user would compare the weight of the collected dust with the mass allowance determined by the new equations to determine if the allowable mass threshold has been exceeded. This is certainly impractical for the majority of most industrial users and for industrial processes where process dust emissions are variable and thereby requiring multiple studies with vacuuming and weighing to establish an accurate dust mass allowance threshold based on process variability. It is also impractical for regulators from a compliance perspective in determining if a dust hazard area exists. It is worthwhile to note that in the Paper Industry, each hour a paper machine is shut down for any reason (e.g. vacuuming dust to establish mass allowance in this case) costs the owner ~$10,000 an hour or ~$240,000 per day. Practicality and costs were not considered by the committee in establishing the new equations.

**Regulatory Issues**

These mass determination and verification methods are also impractical and unenforceable from a regulatory perspective either by Fire Marshals, Fire Inspectors, or OSHA Compliance Officers, to determine compliance or non-compliance if these four equations were adopted into an OSHA Combustible Dust Standard presently being written. The proponents of the new 6.1.2.1, 6.1.2.2, 6.1.3* and 6.1.4* equations have indicated that the user could estimate the mass in an area or building using the weight or mass of a given square meter and estimate the mass visually by mass height per unit area for the dust mass present throughout the area or building. We believe this is impractical and also a recipe for error in establishing risk and compliance/non-compliance with the mass allowances derived from the four new 2011 edition equations proposed.

Based on the fact that there is no loss history and minimal analytical costs incurred by industry to implement the 2006 Edition Section 6.2.3.2 simple settled bulk density equation for establishing acceptable dust accumulation thresholds, AF&PA members believe the dust thickness - settled bulk density equation (2006 Edition) can be used by all of industry and regulators to establish accumulation allowances without unacceptable risks, uncertainties, impracticalities and excessive costs.

**4. Statement of Relief Requested.**

Return the entire 654 report back to committee for rework. Retain the practical “settled bulk density” methodology present in NFPA 654 (2006 Edition), Section 6.2.3.2. Recommend the committee address moisture content in the “settled bulk density” method and establish a limit on the maximum accumulation for dust with settled bulk densities below 2 lbs/ft³.
Maynard, Mary

From: CASTLES, HUGH D [HCASTLE@entergy.com]
Sent: Tuesday, June 29, 2010 3:55 PM
To: Maynard, Mary
Cc: Beach, Denise; RISPOLI, RONALD D; wsnell1@luminant.com; rrschartel@pplweb.com
Subject: RE: NFPA 654 Action

To the NFPA Standards Council:

The Edison Electric Institute (“EEI”) is the association of U.S. shareholder owned electric companies. Its members serve 95 percent of the ultimate customers in the shareholder-owned segment of the industry, and represent approximately 70 percent of the U.S. electric power industry. It also has more than 65 international electric companies as Affiliate members, and more than 170 industry suppliers and related organizations as Associate members. EEI understands that controlling combustible dust is essential to the protection of our most valuable asset – the worker! The investor owned segment of the electric utility industry has long been aware of the dangers surrounding combustible dust. With coal representing approximately 55% of the fuel source used in the US to generate electricity it has been necessary for the industry to control accumulations of combustible dust for many years.

As NFPA is aware, EEI and its members have long placed primary value on protecting the safety and health of our members’ employees, and others who work in our industry. We do this in conjunction with NFPA by having many of our members participate on numerous NFPA Technical committees both representing the industry through EEI and as individuals representing their individual companies.

The EEI has become aware that there are plans to appeal the recent floor action that occurred at the NFPA Conference & Expo (C&E), June 7-10, 2010, at Mandalay Bay Convention Center, Las Vegas, NV in regards to NFPA 654. The EEI had member representatives who attended all aspects of the meeting including educational sections, the exhibits, and voting on the technical documents brought before the membership. As the transcript indicates, the EEI spoke in support of the motions brought before the membership in regards to the proposed new dust accumulation equations contained in NFPA 654. The concerns raised on the floor were that:

- They have not been studied in sufficient detail, substantiated or validated. The technical basis for these equations has not been provided, which suggests that it does not presently exist.
- Details substantiating these equations have not been presented and sufficient time has not been allotted for validating the two equations.
- The value(s) of the entrainment factor(s), which is critical to the use of those equations, has not been validated.
- The two new equations in proposed Sections 6.1.3 and 6.1.4 (explosion and fire protection) are too complex for field application.

Additionally, the new equations which may work for most dusts, do not consider some of the unique characteristics of coal dust (i.e. moisture). Moisture affects the characteristics of dust with regard to the ignition temperature, minimum explosive concentration, maximum pressure, etc. (extracted from NFPA Handbook). Moisture is also considered a factor in a flash fire involving combustible dust as indicated in NFPA 2113 (A.5.2).

Appeals to the standard council are an important part of assuring that all NFPA rules have been followed and that due process and fairness have been upheld throughout the codes and standards development process. We
feel that the process and the overwhelming vote of the membership (no need for count) indicate that the process concerning NFPA 654 met due process and were fair.

Given the attention and importance to the hazard of combustible dust and that the new version of NFPA 654 will be heavily utilized by industry, regulators, and installers/maintainers, we request that the standard council uphold the vote of the membership and return the document to committee for further work.

Hugh Castles  
Chairman, Codes & Standards  
EEI Loss Control/Fire Protection Task Force  
601-896-5855
Maynard, Mary

Subject: FW: Erdem Ural Allegations

NFPA Standards Council and NFPA 654 Technical Committee Members,

As Georgia-Pacific’s representative on the NFPA 654 committee, I would like to assure everyone that Georgia-Pacific and I are absolutely committed to working with the group to develop this new revision of the standard and appreciate that others on the committee will have differing opinions. That said, we must take exception to several statements in an recent email and ballot forwarded to the group from Erdem Ural.

Among our concerns:

We deny Erdem Ural’s allegation that GP has hired John Cholin of JM Cholin Consultants to represent us in our position related to the disposition of NFPA 654, 2011 Edition.

It is interesting to note that presently, 9 committee members oppose the release of the document in its current state with 13 in favor of its release with 1 abstaining. This vote itself refutes Erdem Ural’s claims that only GP is behind the effort to return the document back to committee for additional work. Erdem Ural’s allegation is 100% false.

It is also interesting to note that of the NFPA 654 Technical Committee members/member companies that (~20%) have been or are currently consultants to GP related to combustible dust risk reduction. We have continued to schedule work with these consultants, although some of the following do not share our point of view regarding the new revision of NFPA 654. These consultants include:

- Walt Frank, the NFPA 654 Chair, has been a consultant to GP on two dust assessments, a 2-day training course, and assisted us with a chemical reactivity hazard management study;
- Vahid Ebadat of Chilworth - we use Chilworth almost exclusively for combustible dust sample analyses with over 30 analyses performed to date;
- John Going of Fike - we are utilizing Fike for explosion protection equipment and on occasion laboratory support for combustible dust analyses;
- Paul Hart, GE Global Asset Protection Services (GAPS). GAPS is GP's primary insurance carrier;
- John Cholin, JM Cholin Consultants - has performed one dust assessment for us and is in process of developing a risk assessment methodology for application to air material separators.
- Jack Osborn, Airdusco, Inc. – has performed combustible dust assessments at four facilities.
- Erdem Ural – a proposal for determining entrainment fraction for paper dust was asked of Erdem Ural when the concept was introduced to the committee. Erdem Ural verbally quoted $30,000 for this determination and was not retained to perform the analysis as a result of the price and questions about the validity of the methodology.

AF&PA represents 70 Company Members, 58 Associate Members and 22 Association Members representing more than 300,000 employees in the forest products industry. Not surprisingly, Georgia-Pacific is one of those
70 Company Members. I worked with AF&PA’s Health and Safety Committee in their effort to understand the current requirements and issues with the NFPA 654, 2011 edition. Teleconferences and discussions ensued within the committee, and comments were prepared and reviewed. AF&PA then presented its position on the NFPA 654 document throughout the NFPA 654 2011 edition’s development process with comments submitted during the ROC, ROP and at the NFPA convention in Las Vegas.

We were asked to participate on the NFPA 654 committee to bring an industry perspective to the committee. It is counterproductive to criticize end users such as Georgia-Pacific, AF&PA and OSHA simply because our points of view are different. We should stick to the facts in this standard development process.

Respectfully,

Brice

Brice Chastain, MSPH, CIH
Global Health and Safety
Georgia-Pacific
133 Peachtree St. NE
Atlanta, GA 30303

(404) 245-5872
bchasta@gapac.com
Maynard, Mary

Subject: FW: OSHA Weighs In on New 654 Methodology and Equations

From: Chastain, Brice [mailto:BCHASTA@GAPAC.com]
Sent: Wednesday, June 30, 2010 9:36 AM
To: Cronin, Amy
Subject: OSHA Weighs In on New 654 Methodology and Equations

Amy,

Although you have probably seen the two emails below from OSHA’s Bill Hamilton (headquarters C. Dust Standard writer) and Jason Reason (Indiana CSHO and CIH, CSP, CHMM with extensive combustible dust NEP compliance experience) I am providing them to you to share with the NFPA Standards Council on how OSHA views the new NFPA 654, 2011 edition’s proposed methodology and equations that establish a dust hazard area. Both OSHA’s Bill Hamilton and Jason Reason reveal in the emails below (as they have verbally offline in the Baltimore 654 meeting in Oct. and during the Tampa 664 meeting in Feb.) that the new methodology and equations will be difficult at best for OSHA to accept, apply and use in the field. As a result, OSHA will likely not include the new methodology and equations in the new Combustible Dust Standard under development.

If OSHA rejects the new methodology/equation’s use in their new Standard, I would surmise that the new edition of NFPA 654 when issued would lose relevance in the user community. I believe that NFPA and the NFPA 654 Technical Committee would not consider this the desired outcome.

Also attached is an email from Bill Stevenson (CV Technology and 654 TC member) to Walt Frank (654 Chair) that offers his perspective on this issue.

As you know, I am a proponent of sending the document back to committee for additional work to resolve these issues in order for the new 654 edition to be usable by all of industry including the enforcement community.

Thank you.

Brice

Brice Chastain, MSPH, CIH
Global Health and Safety
Georgia-Pacific
133 Peachtree St. NE
Atlanta, GA 30303

-----Original Message-----
From: Hamilton, Bill - OSHA [mailto:Hamilton.Bill@dol.gov]
Sent: Monday, June 21, 2010 9:39 AM
Subject: RE: E-mail to 654 Committee Ver 2.doc

I feel compelled to comment. I too, am a non-voting member of 654 and others. I was at the meeting in Las Vegas, and have to admit that I was surprised at the result.

Everyone on the dust related committees is aware that federal OSHA is interested in the progress that the committees are making, as OSHA’s proposed combustible dust standard is developed. Jason, and others, make good points about the importance of crafting an NFPA standard that employers and enforcement folks can both use, without having to be an "expert," no matter what OSHA does with its' proposed rule.
In Jason's email, he makes reference to what the federal OSHA may or may not do or include in its rulemaking. I'm sure Jason would agree with me that he was expressing his opinion, and was not speaking for federal OSHA.

The opinions expressed herein are solely mine, and do not necessarily represent the views of my employer.

Bill Hamilton
Fire Protection Engineer
Dept of Labor - OSHA
Directorate of Standards and Guidance
200 Constitution Ave, NW
Washington, DC 20210
202-693-2077

From: Reason, Jason [mailto:jreason@dol.IN.gov]
Sent: Mon 6/21/2010 8:13 AM
Subject: RE: E-mail to 654 Committee Ver 2.doc

To all of the members on the 654 Committee,

I just recently became a member of this committee and I have been an Indiana OSHA (IOSHA) Compliance Safety and Health Officer (CSHO) for over 10 years. In the past two years, I have performed and assisted on almost 30 combustible dust inspections at both the State and Federal levels. I have vast knowledge of combustible dust hazards that I acquired while enforcing standards (including all of the NFPA combustible dust standards) on the combustible dust inspections I have performed over the past 2.5 years. I have also inspected or assisted on several combustible dust fires and explosions.

With all of that being said, I just have to say that the main problem I have with the updated 654 are the formulas contained in Section 6. Combustible dust inspections are difficult enough for CSHOs without introducing formulas that only qualified engineers can understand or properly use. While I see the merit in the formulas and where the committee is going, the numbers (especially the constants) need to be proven before being adopted. I have spoken with other CSHOs who do combustible dust inspections, as well as legal counsel who enforce our combustible dust citations and everyone agrees that enforcing these new formulas in their current form is shaky at best.

I agree with what Bill and Walt said about Section 6.1 in their emails and something needs to be done about these formulas. I can already tell you that if they stay the way they are (i.e. with unproven constants), OSHA will not use them or enforce them. What this means is that OSHA will instead develop their own number for their new combustible dust standard which may or may not match NFPA’s numbers/formulas. If this happens, all of the employers who have combustible dust will follow the OSHA standard and ignore NFPA’s standard because OSHA’s standard is enforceable by law (once it is passed). If the proposed 654 stays the same as it was developed, OSHA may even get to the point where they are with NFPA 61 where most of it will be ignored in rule-making and OSHA will instead develop their own language and requirements when developing the combustible standard. Most CSHOs who enforce NFPA combustible dust standards (including myself) feel that 61 is by far the worst written combustible dust standard due to its many loop holes that the employer can use to not do anything, even if a deflagration hazard exists.

In my opinion, the best course of action right now would be to add the formulas contained in Section 6 to the Annex or place them in Chapter 5 as a Performance Based Option. If we get formulas which are proven in a laboratory setting under conditions that resemble workplace conditions, then they may be an option in the future. I also think we need to develop formulas which are easier to use, especially for the small businesses which barely understand that their dust is even combustible most of the time. Maybe including example calculations in the Annex would help everyone understand these formulas a little better.
Due to a conflict of interest (i.e. enforcing these standards), I have to be a Non-Voting Member of any NFPA committee. However, I am on this committee and several others to offer opinions on how NFPA standards can be better composed to make it easier for the employer to comply and for the OSHA CSHO to enforce/cite any combustible dust hazards they find.

I hope everything works out and we can get a better 654 out there, but I think it will be hard with the formulas contained in Section 6. If anyone has any questions for me or wants to call and discuss this with me please feel free. The best way to reach me is on my cell at 317-372-2042. Thanks a lot guys.

Jason Reason

From: Bill Stevenson [mailto:bstevenson@cvtechnology.com]
Sent: Saturday, June 19, 2010 5:56 PM
Subject: RE: E-mail to 654 Committee Ver 2.doc

Walt,

I have been mulling this whole situation over since the meeting, have read your excellent summary below several times, have read Erdem’s comments as well, have correspondence from John Cholin and still am not sure what the best avenue of approach is at this point. First let me state that I am as frustrated as can be and agree with your’s and Erdem’s assessment. Taking a step back from the heat of battle so to speak, I am trying to put myself in the place of the general membership to see why we lost the battle and what needs to be done to get back on track. Guy made a comment to you and me as we exited the meeting to the effect that this is not as big a deal as we felt that it was. He suggested that we need to caucus the committee and decide if we should go back to the ROP stage or to the ROC stage, try to develop compromises as appropriate, and then return with what might be slight revisions that would be more agreeable to all parties concerned.

At the meeting, and this struck me forcefully at the time, there were 5 members of the TC present, 3 for and 2 against. To an outsider with no background it might have seemed that the TC is divided. And even though we pointed out the overwhelming vote on each issue by the TC, it is telling that so few of the members came to the meeting to defend our work. Next, the arguments raised by the opposition were carefully phrased to show that there was an impact to adoption that they persuasively argued would be negative. Our arguments in defense were technical in nature and did not do enough to address the issues in terms of the benefits of adoption of the new document in strong, well-prepared terms. We quite simply were outclassed in the debate. As you state yourself, it has taken us 2 years to come to grips with all the issues. To someone coming to it cold without sufficient background, it could be seen as prudent to return the document for further review.

We need to hear from Guy. We probably ought to have a quick meeting to discuss our options. My sense of this is that if we take a hard line on each and every issue, we will not be able to resolve the disputes as quickly or as easily as if we take a conciliatory approach and try to work to find compromise acceptable to all concerned.

In my view the crux of the problem is section 6.1. The argument that there is no basis for the entrainment factor is valid. We are going to find it tough sledding to get that section accepted until we have testing to validate it. At the same time, even the opposition agreed that this methodology has a lot of merit and should not be lost. The compromise might be to allow the use of the new method as one option while retaining the old method as a second option through one more revision cycle.

We are in total agreement that this document should not be unduly held up. The new document is superior in every way. Let’s focus on the goal of getting the document on the street as fast as possible and with a minimum of rancor.
firmly believe that taking an approach of being willing to work toward compromise is more likely to achieve the desired end result with minimal delay.

Bill
July 20, 2010

TO THE NFPA STANDARDS COUNCIL:

I am the chair of the Technical Committee on the Handling and Conveying of Dusts, Vapors, and Gases – the TC responsible for NFPA 654. Along with the balance of the committee, I have worked for over two years to deliver a revision of NFPA 654 that would provide needed enhancements in combustible dust safety within industry.

The availability of that improved guidance has now been delayed by at least two years, based upon the actions taken during the NFPA Technical Meeting in Las Vegas. Like many on the TC, I view what transpired in Las Vegas to have been a regrettable abuse of a valid mechanism provided by NFPA to allow minority opinions to be heard. I discuss this further, below.

I have filed three appeals, on my own behalf, for actions taken at the Technical Meeting. These were forwarded to the Council by e-mail on 6/29/10. I stand behind these appeals, but I will not be able to attend the Standards Council meeting on August 4. As a self-employed consultant, I have found that the cost of participating on (and in my case, chairing) an NFPA TC can be considerable, both in terms of the out-of-pocket expenses and the cost of lost revenue opportunities. The costs becomes even more unreasonable when the person writing the checks learns how easily the value of the real and sweat-equity investments can be invalidated by special interest groups (as discussed herein). Seeking to control costs as best I can, and having been forewarned that the Standards Council’s vote in support of the actions taken in Las Vegas was almost a forgone conclusion, I am regretfully unable to attend the August 4 meeting to speak in support of my appeals.

I request that Dr. Erdem Ural be permitted to speak on my behalf at the meeting.

Let me be clear that I support the NITMAM process. It provides a valuable mechanism for those having divergent opinions to have their message heard. I was, however, quite surprised and dismayed by the outcome of the Las Vegas meeting. I do not feel that the product, which the TC labored over for two years, received a balanced hearing based upon sound, factual analysis. Bluntly put, facts did not seem to matter, but rhetoric did, and the standard was returned to the TC.

I want to carefully point out that my statements below do not pertain specifically to any individual, or any particular statement made. However, in general, I believe that many of the statements made in the NITMAMs and in the Las Vegas Technical Meeting in support of the motions to amend were wholly unsubstantiated, technically ill-considered, or just plain false. From the perspective of someone who actually understands the issues under debate, it is hard to infer whether the misstatements made in the meeting came as a consequence of the commenter not trying hard enough to really understand the technical issues, or whether they were willful attempts to mislead. In either case, many of the assertions made (and, apparently made in
coordination with other commenters) were blatantly false – but sufficient to sway the voting membership.

If one has any confidence in the system for vetting and approving TC members, it must be assumed that the TC represents a cross section of experts on the topic. What we witnessed in Las Vegas was the scuttling of two years of dedicated, and informed, efforts on the part of the TC. And this was achieved by a handful of special interests swaying the far less informed voting membership through the coordinated repetition of emotional appeals, hyperbole, false statements, and at least one cheap shot directed towards me and NFPA staff implying improprieties with respect to scheduling of the conference calls required to finish the TC’s deliberations on the ROC draft.

Further, one NITMAM submitter continued to confuse the ROP version of the standard with the ROC version, and commented on matters that were no longer in the final draft of the standard under review in Las Vegas. This confusion resulted in a number of NITMAMs being summarily tabled, which has prompted another appeal to the Council – I will return to this matter later.

My three appeals are self-supporting in their technical detail. I will not comment further on them here.

While I am sure the TC could further improve NFPA 654, I still believe that the TC has made major improvements in the document. I am proud enough of our work to believe that workers and companies would have been better protected had our version of 654 been released. Regrettably, that release is now likely to be delayed. I am gravely concerned that needless fatalities will result as a consequence of such a delay.

I will close with the following commentary on other NFPA 654-related appeals that have been filed with the Standards Council:

Mr. Francis’ appeal:

Mr. Francis discusses the fact that a number of motions were tabled after passage of the motion to return paragraph 6.1 to the TC. This was based upon the perception that the material covered by the tabled motions was part of paragraph 6.1. In actuality, this was a misconception fostered by Mr. Francis’ error in framing parts of his NITMAMs based upon the content of the ROP version of the standard. The material covered by the tabled motions was not in paragraph 6.1 in the final ROC version of the standard.

For what it is worth, the meeting transcript does not reveal that there was a motion to table. The decision to table was a consensus decision worked out between the Technical Meeting Chair, Mr. Francis, and Mr. Cholin. I will return to this topic when I discuss Mr. Cholin’s appeal.

Mr. Francis makes reference to “some questionable scheduling of conference calls by the committee” even while admitting that he “was not party to any of those calls.” He later justifies returning the standard to the TC based, in part, on “procedural errors” – clearly another reference to the canard that there were irregularities with regard to how the final conference calls were
scheduled as the TC was completing the ROC version of the standard (as implied by Mr. Chastain from the floor in Las Vegas).

I request that the Standards Council review this matter and make a determination as to whether or not NFPA policies with respect to the scheduling of meetings were correctly followed.

**Mr. Chastain’s appeal:**

Mr. Chastain does not appear to be appealing anything. I see no relevance in Mr. Chastain’s filing to the matters at hand.

**Mr. Cholin’s appeal:**

Mr. Cholin proposes a hypothetical situation in the second to last paragraph on page 2 of his document. He contrasts the dust layer thickness allowed at a hypothetical paper recycle facility, as determined using the thickness criterion in the 2006 edition of NFPA 654 compared to the thickness calculated from the equations proposed for the NFPA 654 revision. He cites a 50X decrease in allowed thickness using the proposed equations. This is an apples to oranges comparison.

The hypothetical example assumes a room with a floor area of 20,000 ft². The thickness criterion in the 2006 edition of NFPA 654 would allow a dust depth of 0.48 inches (after adjusting for the bulk density of the dust). However, it is the intent of the standard that this depth of dust only is permitted to accumulate on 5% of the floor area (1000 ft²).

Regrettably, this 5% restriction only appears in an Annex in the standard and, thus, is not mandatory. If the 5% restriction is ignored, this hypothetical example would allow the accumulation of 4000 lbs of combustible dust in the room. This is a sobering thought, considering that only a few hundred pounds of dust are sufficient to blow the room apart, or to fill the room with a life-threatening fireball. This is one example of the weaknesses in the current version of the standard, which the TC sought to remedy.

If we take the results of the dust mass calculation that Mr. Cholin cites, and distribute the dust over the same 1000 ft², the resulting dust layer depth would be 0.2 inches. This is a 2.5X reduction, not a 50X reduction, when the calculations share a fair and common basis. This is the sort of hyperbole that the proponents of the revised standard have had to deal with.

While I am confident that Mr. Cholin did not seek to do so, he has likely demonstrated what makes the vague and non-protective thickness criterion so enticing to its devotees.

Mr. Cholin seeks to appeal the tabling of several of his motions during the Las Vegas meeting, specifically CAM 654-6 and CAM 654-8.

As described above in the discussion of Mr. Francis’ appeal, the motions were tabled because they were perceived to be part of paragraph 6.1 of NFPA 654. Section 6.1 had already been voted (under CAM 654-9) to be returned to the TC. Subsequently, based upon a suggestion from
the floor, the Technical Meeting Chair decided that these motions were moot points, and they were tabled.

As I pointed out to the Chair, the portions of the standard affected by CAM 654-6 and CAM 654-8 were, in fact, not part of section 6.1. They were, rather, mischaracterized as such solely because Mr. Francis erroneously claimed that they were in 6.1 (as he had based his NITMAM on the structure of the document that appeared in the ROP, not the ROC version of the document).

I clearly pointed this out to the Chair, and advised that these, and other similar motions, should be heard so that the TC could be informed by the debate from the floor. I did not prevail.

Mr. Cholin had an opportunity to protest from the floor the tabling of his motions. He elected not to do so. Now he seeks a back door way of getting them heard anyway. In fact, this is all the more unsettling when you consider the following quote from the meeting transcripts:

“JOHN CHOLIN: Mr. Chair, I would like that we table my motions until we consider the motion to return the entire document to committee.”

Now Mr. Cholin seeks to appeal the very action that he proposed from the floor. As to CAM 654-6 and CAM 654-8, I came to the Technical Meeting fully prepared to speak against these motions. I was denied that opportunity. Since I am unable to attend the Standards Council meeting, I will again be denied the opportunity to speak against the motions should the Standards Council decide to consider them. I protect most vigorously any further consideration of these motions.

W. L. Frank, P.E.
President, Frank Risk Solutions, Inc.
Chair of the Technical Committee on the Handling and Conveying of Dusts, Vapors, and Gases
This is to notify you of our intention to appeal the actions of the committee regarding NFPA 654, *Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids*, CAM654-9. The committee’s action failed to acknowledge the sentiment of the National Fire Protection Association membership as expressed in the membership vote during the Technical Sessions of the Annual Conference. Committee Chair Mr. Frank was afforded ample opportunity to rebut the statements made by those who testified on this issue. The technical and general issues were debated at length. The membership was persuaded to ask the committee to revisit these issues.

It is my belief that the membership correctly recognized that the 654 committee has erred in three specific areas.

1. The proposed new document relies on unvalidated values for factors in the newly introduced equations. I submit, and the Association membership agreed in its vote, that the elements of equations to be used in such an important potential enforcement tool must be based upon data and research. It is improper to “presume” a value for a factor, and then use the requirement to see if it works!

2. Nowhere in the development process has any of the proponents shown any data suggesting that the current requirements in 654 have failed. There was none offered during the Technical Session debate. While the new concepts may offer promise for the future, they should not be the only compliance path where a proven, reliable, and relatively simple path exists in the code now.

3. Enforcement of the proposed compliance path, which was the subject of my motion, is nearly impossible. Under the proposal, Fire Officials and other AHJs will face an absolute nightmare as they would be required to conduct sampling and then calculate to see if they have compliance or noncompliance.

It is important to add one other point. In his email to the committee in advance of its balloting the NITMAM (CAM 654-9) result, the chair suggested that only a couple of items were acted upon. That is true but perhaps misleading. It must be recalled that during the debate I suggested, based on three previous votes, that we could save the Association valuable time by skipping four or five more of my motions, to my motion to return the whole document to Committee. After the Moderator, General Counsel, and staff conferred, they allowed me to make that motion and it passed handily. So while there were only a few motions heard, it was because the decision to send the document back to Committee mitigated any need to handle additional items.

Lastly, the only procedural issues raised had to do with some questionable scheduling of conference calls by the committee. I was not party to any of those calls and cannot comment other than to observe that I carefully complied with every procedural test in moving my motion, including one motion the Motions Committee would not certify. Because of both substantive and procedural errors, as well as the expressed will of the voting membership, I urge the Standards Council to send NFPA 654 back to the committee for further consideration.
In summary, I wish to appeal the committee’s ballot on the Motion to Return The Document. I will be unable to attend the Standards Council’s meeting. One of the American Forest & Paper Association’s (AF&PA) members, Mr. Brice Chastain, of Georgia-Pacific, will be attending and represent AF&PA on this matter.

Sam Francis  
Northeast Director  
Building Codes and Standards  
American Forest & Paper Association
July 20, 2010

TO THE NFPA STANDARDS COUNCIL:

I am the chair of the Technical Committee on the Handling and Conveying of Dusts, Vapors, and Gases – the TC responsible for NFPA 654. Along with the balance of the committee, I have worked for over two years to deliver a revision of NFPA 654 that would provide needed enhancements in combustible dust safety within industry.

The availability of that improved guidance has now been delayed by at least two years, based upon the actions taken during the NFPA Technical Meeting in Las Vegas. Like many on the TC, I view what transpired in Las Vegas to have been a regrettable abuse of a valid mechanism provided by NFPA to allow minority opinions to be heard. I discuss this further, below.

I have filed three appeals, on my own behalf, for actions taken at the Technical Meeting. These were forwarded to the Council by e-mail on 6/29/10. I stand behind these appeals, but I will not be able to attend the Standards Council meeting on August 4. As a self-employed consultant, I have found that the cost of participating on (and in my case, chairing) an NFPA TC can be considerable, both in terms of the out-of-pocket expenses and the cost of lost revenue opportunities. The costs becomes even more unreasonable when the person writing the checks learns how easily the value of the real and sweat-equity investments can be invalidated by special interest groups (as discussed herein). Seeking to control costs as best I can, and having been forewarned that the Standards Council’s vote in support of the actions taken in Las Vegas was almost a forgone conclusion, I am regretfully unable to attend the August 4 meeting to speak in support of my appeals.

I request that Dr. Erdem Ural be permitted to speak on my behalf at the meeting.

Let me be clear that I support the NITMAM process. It provides a valuable mechanism for those having divergent opinions to have their message heard. I was, however, quite surprised and dismayed by the outcome of the Las Vegas meeting. I do not feel that the product, which the TC labored over for two years, received a balanced hearing based upon sound, factual analysis. Bluntly put, facts did not seem to matter, but rhetoric did, and the standard was returned to the TC.

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coordination with other commenters) were blatantly false – but sufficient to sway the voting membership.

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While I am sure the TC could further improve NFPA 654, I still believe that the TC has made major improvements in the document. I am proud enough of our work to believe that workers and companies would have been better protected had our version of 654 been released. Regrettably, that release is now likely to be delayed. I am gravely concerned that needless fatalities will result as a consequence of such a delay.

I will close with the following commentary on other NFPA 654-related appeals that have been filed with the Standards Council:

**Mr. Francis’ appeal:**

Mr. Francis discusses the fact that a number of motions were tabled after passage of the motion to return paragraph 6.1 to the TC. This was based upon the perception that the material covered by the tabled motions was part of paragraph 6.1. In actuality, this was a misconception fostered by Mr. Francis’ error in framing parts of his NITMAMs based upon the content of the ROP version of the standard. The material covered by the tabled motions was not in paragraph 6.1 in the final ROC version of the standard.

For what it is worth, the meeting transcript does not reveal that there was a motion to table. The decision to table was a consensus decision worked out between the Technical Meeting Chair, Mr. Francis, and Mr. Cholin. I will return to this topic when I discuss Mr. Cholin’s appeal.

Mr. Francis makes reference to “some questionable scheduling of conference calls by the committee” even while admitting that he “was not party to any of those calls.” He later justifies returning the standard to the TC based, in part, on “procedural errors” – clearly another reference to the canard that there were irregularities with regard to how the final conference calls were
I request that the Standards Council review this matter and make a determination as to whether or not NFPA policies with respect to the scheduling of meetings were correctly followed.

**Mr. Chastain’s appeal:**

Mr. Chastain does not appear to be appealing anything. I see no relevance in Mr. Chastain’s filing to the matters at hand.

**Mr. Cholin’s appeal:**

Mr. Cholin proposes a hypothetical situation in the second to last paragraph on page 2 of his document. He contrasts the dust layer thickness allowed at a hypothetical paper recycle facility, as determined using the thickness criterion in the 2006 edition of NFPA 654 compared to the thickness calculated from the equations proposed for the NFPA 654 revision. He cites a 50X decrease in allowed thickness using the proposed equations. This is an apples to oranges comparison.

The hypothetical example assumes a room with a floor area of 20,000 ft². The thickness criterion in the 2006 edition of NFPA 654 would allow a dust depth of 0.48 inches (after adjusting for the bulk density of the dust). However, it is the intent of the standard that this depth of dust only is permitted to accumulate on 5% of the floor area (1000 ft²).

Regrettably, this 5% restriction only appears in an Annex in the standard and, thus, is not mandatory. If the 5% restriction is ignored, this hypothetical example would allow the accumulation of 4000 lbs of combustible dust in the room. This is a sobering thought, considering that only a few hundred pounds of dust are sufficient to blow the room apart, or to fill the room with a life-threatening fireball. This is one example of the weaknesses in the current version of the standard, which the TC sought to remedy.

If we take the results of the dust mass calculation that Mr. Cholin cites, and distribute the dust over the same 1000 ft², the resulting dust layer depth would be 0.2 inches. This is a 2.5X reduction, not a 50X reduction, when the calculations share a fair and common basis. This is the sort of hyperbole that the proponents of the revised standard have had to deal with.

While I am confident that Mr. Cholin did not seek to do so, he has likely demonstrated what makes the vague and non-protective thickness criterion so enticing to its devotees.

Mr. Cholin seeks to appeal the tabling of several of his motions during the Las Vegas meeting, specifically CAM 654-6 and CAM 654-8.

As described above in the discussion of Mr. Francis’ appeal, the motions were tabled because they were perceived to be part of paragraph 6.1 of NFPA 654. Section 6.1 had already been voted (under CAM 654-9) to be returned to the TC. Subsequently, based upon a suggestion from
the floor, the Technical Meeting Chair decided that these motions were moot points, and they were tabled.

As I pointed out to the Chair, the portions of the standard affected by CAM 654-6 and CAM 654-8 were, in fact, not part of section 6.1. They were, rather, mischaracterized as such solely because Mr. Francis erroneously claimed that they were in 6.1 (as he had based his NITMAM on the structure of the document that appeared in the ROP, not the ROC version of the document).

I clearly pointed this out to the Chair, and advised that these, and other similar motions, should be heard so that the TC could be informed by the debate from the floor. I did not prevail.

Mr. Cholin had an opportunity to protest from the floor the tabling of his motions. He elected not to do so. Now he seeks a back door way of getting them heard anyway. In fact, this is all the more unsettling when you consider the following quote from the meeting transcripts:

“JOHN CHOLIN: Mr. Chair, I would like that we table my motions until we consider the motion to return the entire document to committee.”

Now Mr. Cholin seeks to appeal the very action that he proposed from the floor. As to CAM 654-6 and CAM 654-8, I came to the Technical Meeting fully prepared to speak against these motions. I was denied that opportunity. Since I am unable to attend the Standards Council meeting, I will again be denied the opportunity to speak against the motions should the Standards Council decide to consider them. I protect most vigorously any further consideration of these motions.

W. L. Frank, P.E.
President, Frank Risk Solutions, Inc.
Chair of the Technical Committee on the Handling and Conveying of Dusts, Vapors, and Gases
1. Name: John M. Cholin, P.E.

Affiliation: J.M.Cholin Consultants, Inc.

Address: 101 Roosevelt Dr.
Oakland, NJ 07436-2008 USA

2. This action relates to Motion Sequence Numbers:
   - 654-1 to restore the term “Deflagration” in lieu of “Flash Fire” in the document
   - 654-3 to return Section 6.1 back to the Technical Committee
   - 654-6 to accept Comment 654-33, and
   - 654-8 accept proposal 654-7 and 654-10, submitted by John M. Cholin, P.E., J.M.Cholin Consultants, Inc. and,
   - 654-9 submitted by Sam Francis, AF&PA to Return Entire Report back to committee. (See page 5)

3. Argument setting forth grounds for appeal:

654-1

I moved to replace the “dust flash fire” terminology with “dust deflagration” terminology. During the ROP meeting the TC voted to do this. The justification was that the fire protection engineering and building code enforcement communities have an understanding of what a deflagration is and there is a benefit to remaining consistent with this terminology. However, I am told that during one of the subsequent teleconference meetings (I was teaching during the first and did not receive any advanced notice of the second) it was moved to switch it back. I believe that this was a mistake. The membership of NFPA present at the voting agreed with using the term “deflagration” rather than “flash fire”.

654-3

I opposed the new section 6.1 on the basis that it is:
1. incomplete
2. requires the use of a computational assessment that relies upon a parameter whose numerical value we do not know,
3. requires the use of a computational assessment that relies upon a parameter for which there is no current test method for determining its numerical value, and
4. Establishes an acceptable level of employee injury that has not been determined to be acceptable to society.

We all recognized that there was a problem with the 2006 edition in that it did not clearly establish what constituted an “explosion hazard” yet relied upon the phrase “where an explosion hazard exists...” to establish requirements for protection. We have been using the language in the current 6.2.3.1 to back into the determination of where an explosion
hazard exists in the building interior. But there is no explicit language in the document establishing what the TC deems constitutes an “explosion hazard”. This issue was addressed in Proposals 654-7 and 654-10. The ROP indicates that the issue was addressed by the committee by Accepting in Principal. No comment was made because the section on hazard determination was still in a state of flux during the comment period. But the new language in Section 6.1 of the proposed 2010 edition does not address anything but building compartments. So we are still in a situation where we have numerous requirements in Chapter 7 that rely upon the predicate phrase “where an explosion hazard exists” but nowhere does the standard clearly spell out what criteria one should use to determine if a vessel, duct, conveyor, bin bunker, silo, etc. constitutes an explosion hazard. How is the user supposed to know? Does a silo with 1% deflagrable (explosible) particulate mixed in with the big stuff constitute an “explosion hazard”? How about a pneumatic conveyance duct? We can’t expect the operator to perform a PHA to identify the hazards if we do not clearly establish what the TC deems a hazard.

This is an important issue as most of the post-event litigation ultimately boils down to whether the hazard was adequately recognized. Were the requirements of the nationally recognized standard of care, NFPA 654 observed correctly? When there is ambiguity in what constitutes an explosion hazard it is easy for the lawyers to argue that the requirements of Chapter 7 are not applicable. This is a big chink of work that just got forgotten while everybody was grappling with the implications of introducing the hazard assessment relations for the building interior spaces. Unfortunately, it makes the document incomplete.

But there are still problems with the algebraic relations (equations 6.1.2.1, 6.1.2.2, 6.1.3 and 6.1.4). This is not to say that conceptually the document isn’t headed in the right direction, it is, but we are not where we want or need to be yet.

I have a paper recycler with a 20,000 ft² (1,858 m²) facility, 32 feet floor slab to roof deck. The bulk density of the paper dust is approximately 5 lb/ft³. According to 6.2.3.1 of 654-2006 this operator is allowed a dust layer of 0.48 inches in depth. Under 654-2010, using the simple relations in 6.1.2.1 and 6.1.2.2, this operator is allowed 37 kg (82 lb) of dust in the facility for the personnel safety objective and 72 kg (159 lb) for the building structure objective. At 5 lb/ft³ this equates to a layer 0.0098 inches thick for the personnel objective and 0.019 inches thick for the structural objective! This is far less than the level permitted by the current 654. Do we have a loss history that justifies this 50-fold reduction in the permissible dust layer for personnel objective and 25-fold reduction for the structural objective? These relations, 6.1.2.1 and 6.1.2.2, treat all particulates the same regardless of the bulk density, net heat of combustion or KSt. consequently, they produce results that are excessively conservative when used for the majority of the particulates that we encounter.

Now this facility is operated by a client of mine and it actually had a deflagration in the process equipment which vented into the facility interior. The whole event was caught on videotape. There was no propagation of a deflagration fueled by the dust accumulations. I realize that one event does not constitute a trend. But this client has had two similar events at a second facility of the same size and neither of those resulted in propagation. So this client has some faith in 654-2006 but is not convinced that the limits in 654-2010 are valid.
So let's use 6.1.3 and 6.1.4. \( P_{\text{max}} = 6.6 \text{ bar}; \ C_w = 500\text{g/m}^3 \). It's a long-term lease of a spec building in an industrial park so we will assume a wall strength of 40 PSF and a DLF of 1.5 (worst-case). According to equation 6.1.3 \( M_{\text{exp}} = \frac{17,583}{\eta_D} \) grams. But what value do we use for \( \eta_D \)? At Interfibe (another paper recycler that had a serious explosion several years ago) there were dust accumulations of 4 to 8 inches before the event (from contractor photos) and less than 1 inch after the event (scene documentation). At my client’s locations the 3 events we have investigated left the area near the vented deflagration clean – no residual dust. So I guess I shouldn’t use the “default value” but assume a worst-case limit of 1.00 for \( \eta_D \). For calculating the permissible dust layer for the structural objective that allows me 17.5 kg over the 1,858 m² area for a total of 9.46 grams per m². This is equivalent to .0046 inch thick layer if the layer is disturbed evenly over the entire interior. Even if I used the default value for \( \eta_D = 0.25 \) we get a layer 4 times that thickness or 0.018 inches in thickness. This is far less than dust layer depths that did not produce a propagating deflagration in 3 out of 3 incidents. For the personnel safety objective, again setting \( \eta_D = 1 \), I get .244.4 kg/\( \eta_D \) of dust permitted over the 1,858 m² area for a total of 131.5 g/m². At 5 lb/ft³ this equates to 0.32 inch in depth, much closer to what I get using 654-2006. Yet this client has 3 events on videotape with dust depths greater than this number and there has been no evidence of deflagration extension into the building interior even though there appeared to be 100% dispersion. If I use \( \eta_D = 0.25 \) I get a dust layer depth of 1.28 inches over the entire interior area. I cannot expect that much dust to not produce a propagating deflagration.

I understand that if the fugitive dust accumulations were limited to a fraction of the area of the facility that this computational method would allow for deeper dust layers in that fractional area. And that is a definite advantage, especially for the denser, more energetic dusts that pose a greater hazard and in process facilities where the fugitive dust layers occupy a fraction of the building. Less dense dusts tend to migrate further and a commensurately larger portion of the facility must be used in the area calculations. If I assume that the dust in the above example only occupies 25% of the total building floor area then the dust layer thickness becomes 5 inches, equal to what blew two employees out the end of the Interfibe building.

Something is wrong here. And there is NO ALTERNATIVE to using these relations in the proposed new standard.

In the current edition of the standard we have the simple measurement in 6.2.3.1 and if we don’t think the result is reasonable we can correct for bulk density and net heat of combustion and get a number that is more closely correlated to the actual dust in question. We have no loss history that I can find that suggests that the simple relation in NFPA 654-2006 is insufficiently conservative to allow for safe operations.

With the proposed new edition we have only one alternative, and that is to come up with a value for \( \eta_D \) other than the default value. Minor problem – there is no test method for doing that! Until we have a method for quantifying how much dust is going to be dispersed, regardless of the mechanism, and the fraction of the dispersed material that actually participates in the combustion process we are stuck. Without this information we cannot even use Chapter 5 to develop a hazard determination criterion.

That is why there is so much opposition to these relations right now. When we plug in data for real-life situations they lead to conclusions that are unachievable or are not
supported by the loss history. Furthermore, the tools facility operators need to comply with the requirements that are laid-out in the proposed new standard don’t yet exist.

Before we can use this computational method we must have a method to quantify how much of an accumulated layer is dispersed, regardless of the actual mechanism. We must have a method to quantify how much of the dispersed dust actually burns. We must have a method to quantify the results of the combustion. Le Chatier’s principal tells us that when a chemical reaction does mechanical work it tends not to proceed to completion. Pressurizing a building and accelerating dust is mechanical work. Heating the dust up to AIT absorbs heat. In most of the event reconstructions I have done I find that the combustion process consumes the majority of the oxygen and becomes oxidant-limited. These factors all contribute to likelihood that the initial ignition will lead to a propagating deflagration.

We have not yet had the time to connect all of the dots. We have a partial computational model of what we expect to happen. Now we have to try to verify that model with event data to see if the model is a good predictor of the event. This hasn’t occurred. The initial “reality-checks” I have started with my event data suggests that there are unaddressed issues that we should address before we issue this document as the nationally recognized minimum-compliance standard of care.

The TC has used a 5% probability of flame impingement criterion in the personnel objective relations. As I remember Bob Zalosh’s presentation during the ROP meeting he used 5% as an example. Was it his intent that the TC simply embrace that number as the appropriate value? Is this number acceptable to the stakeholders at the site? Is it acceptable to the workman’s compensation insurance carrier, the owner and the employees? NFPA 654 should not stipulate what this acceptable loss level is – it should be left to the owner/operator and the other stakeholders in the site.

Finally, we need to keep in mind that this standard is not for us – we have been entrusted with writing it for the American public. It is supposed to be a hazard management tool that enforcement personnel, plant managers, facility engineers and consultants can used to manage the hazards encompassed by the scope statement. If we make the document too difficult to use we will make it irrelevant. OSHA is going to develop its own dust explosion hazard regulation which will permit the use of NFPA standards as a performance-equivalent alternative (I hope). We can make our document easy to use or hard to use. If it is easy to use then facility operators will use it and we have the ability to ensure that they are using methods that assure their employees and owners that the hazards are properly addressed. If we don’t, then the document that gets used will be written by some one else and we loose the leadership position. I don’t think there is a more competent, devoted group of people than our TC.

**654-6**

I moved adoption of comment # 654-33. When the TC decided to move the requirements for return air diversion to the section on air-material separators, a good idea, it managed to loose the requirement for return air diversion and, instead, required deflagration isolation. At Rochester Shoe Tree deflagration isolation was provided on the return air duct. When the dust collector caught fire, smoke, flame and burning filter media was conveyed back into the plant setting the plant on fire, burning 5 employees.
and destroying the building. The deflagration isolation system, that is now required by the proposed new edition of 654 and manufactured by a firm that is represented on the TC, never operated. That’s because the deflagration isolation system relies upon pressure sensors for actuation. During a dust collector fire the needed pressure rise does not occur. Furthermore, even if it did actuate, the deflagration isolation system does not provide sufficient agent to offset the nominal 10-25 MW heat release rate of a dust collector fire. Indeed, the Listing of deflagration isolation systems does not contemplate the prevention of flame from vessel fires, only the transitory flow of deflagration flame front.

The only effective means of managing the fire hazard associated with the return of cleaned air from a dust collector is with return air diversion using abort gates. The overwhelming majority of the dust collector explosions we see start off as dust collector fires which transition to deflagration when the automatic bag cleaning feature operates. Only a fraction of the dust collector fires end up as explosions. Accepting Comment 654-33 would fix this error.

654-8

I moved that the membership accept proposal 654-7 and 654-10. These two proposals establish definitions for “deflagration hazard” and “explosion hazard” so the requirements in Chapter 7 would actually have an explicit definition to rely upon. These motions were tabled during the annual meeting pending the outcome of the vote on 654-9.

654-9 submitted by Sam Francis, AF&PA

I support this motion. There are numerous interdependencies and cross-references within this document. If selected motions to amend are accepted without returning the entire document to the technical committee there is a very real possibility that a disjointed, internally inconsistent document would result, precipitating the need for any number of Tentative Interim Amendments.

4. Statement of Relief Requested.

Return the entire 654 report back to committee. There are enough problems with the proposed document that a piece-meal repair is not practical and would likely lead to a document that is either internally inconsistent or incompletely addresses the fire and explosion hazard management issues.
July 20, 2010

TO THE NFPA STANDARDS COUNCIL:

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The availability of that improved guidance has now been delayed by at least two years, based upon the actions taken during the NFPA Technical Meeting in Las Vegas. Like many on the TC, I view what transpired in Las Vegas to have been a regrettable abuse of a valid mechanism provided by NFPA to allow minority opinions to be heard. I discuss this further, below.

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scheduled as the TC was completing the ROC version of the standard (as implied by Mr. Chastain from the floor in Las Vegas).

I request that the Standards Council review this matter and make a determination as to whether or not NFPA policies with respect to the scheduling of meetings were correctly followed.

Mr. Chastain’s appeal:

Mr. Chastain does not appear to be appealing anything. I see no relevance in Mr. Chastain’s filing to the matters at hand.

Mr. Cholin’s appeal:

Mr. Cholin proposes a hypothetical situation in the second to last paragraph on page 2 of his document. He contrasts the dust layer thickness allowed at a hypothetical paper recycle facility, as determined using the thickness criterion in the 2006 edition of NFPA 654 compared to the thickness calculated from the equations proposed for the NFPA 654 revision. He cites a 50X decrease in allowed thickness using the proposed equations. This is an apples to oranges comparison.

The hypothetical example assumes a room with a floor area of 20,000 \text{ft}^2. The thickness criterion in the 2006 edition of NFPA 654 would allow a dust depth of 0.48 inches (after adjusting for the bulk density of the dust). However, it is the intent of the standard that this depth of dust only is permitted to accumulate on 5\% of the floor area (1000 \text{ft}^2).

Regrettably, this 5\% restriction only appears in an Annex in the standard and, thus, is not mandatory. If the 5\% restriction is ignored, this hypothetical example would allow the accumulation of 4000 lbs of combustible dust in the room. This is a sobering thought, considering that only a few hundred pounds of dust are sufficient to blow the room apart, or to fill the room with a life-threatening fireball. This is one example of the weaknesses in the current version of the standard, which the TC sought to remedy.

If we take the results of the dust mass calculation that Mr. Cholin cites, and distribute the dust over the same 1000 \text{ft}^2, the resulting dust layer depth would be 0.2 inches. This is a 2.5X reduction, not a 50X reduction, when the calculations share a fair and common basis. This is the sort of hyperbole that the proponents of the revised standard have had to deal with.

While I am confident that Mr. Cholin did not seek to do so, he has likely demonstrated what makes the vague and non-protective thickness criterion so enticing to its devotees.

Mr. Cholin seeks to appeal the tabling of several of his motions during the Las Vegas meeting, specifically CAM 654-6 and CAM 654-8.

As described above in the discussion of Mr. Francis’ appeal, the motions were tabled because they were perceived to be part of paragraph 6.1 of NFPA 654. Section 6.1 had already been voted (under CAM 654-9) to be returned to the TC. Subsequently, based upon a suggestion from
the floor, the Technical Meeting Chair decided that these motions were moot points, and they were tabled.

As I pointed out to the Chair, the portions of the standard affected by CAM 654-6 and CAM 654-8 were, in fact, not part of section 6.1. They were, rather, mischaracterized as such solely because Mr. Francis erroneously claimed that they were in 6.1 (as he had based his NITMAM on the structure of the document that appeared in the ROP, not the ROC version of the document).

I clearly pointed this out to the Chair, and advised that these, and other similar motions, should be heard so that the TC could be informed by the debate from the floor. I did not prevail.

Mr. Cholin had an opportunity to protest from the floor the tabling of his motions. He elected not to do so. Now he seeks a back door way of getting them heard anyway. In fact, this is all the more unsettling when you consider the following quote from the meeting transcripts:

“JOHN CHOLIN: Mr. Chair, I would like that we table my motions until we consider the motion to return the entire document to committee.”

Now Mr. Cholin seeks to appeal the very action that he proposed from the floor. As to CAM 654-6 and CAM 654-8, I came to the Technical Meeting fully prepared to speak against these motions. I was denied that opportunity. Since I am unable to attend the Standards Council meeting, I will again be denied the opportunity to speak against the motions should the Standards Council decide to consider them. I protect most vigorously any further consideration of these motions.

W. L. Frank, P.E.
President, Frank Risk Solutions, Inc.
Chair of the Technical Committee on the Handling and Conveying of Dusts, Vapors, and Gases
1. Name: John M. Cholin, P.E.
   Affiliation: J.M.Cholin Consultants, Inc.
   Address: 101 Roosevelt Dr.
   Oakland, NJ 07436-2008 USA

2. This action relates to Motion Sequence Numbers:
   - 654-1 to restore the term “Deflagration” in lieu of “Flash Fire” in the document
   - 654-3 to return Section 6.1 back to the Technical Committee
   - 654-6 to accept Comment 654-33, and
   - 654-8 accept proposal 654-7 and 654-10, submitted by John M. Cholin, P.E.,
     J.M.Cholin Consultants, Inc. and,
   - 654-9 submitted by Sam Francis, AF&PA to Return Entire Report back to committee.

3. Argument setting forth grounds for appeal:

   654-1

   I moved to replace the “dust flash fire” terminology with “dust deflagration” terminology. During the ROP meeting the TC voted to do this. The justification was that the fire protection engineering and building code enforcement communities have an understanding of what a deflagration is and there is a benefit to remaining consistent with this terminology. However, I am told that during one of the subsequent teleconference meetings (I was teaching during the first and did not receive any advanced notice of the second) it was moved to switch it back. I believe that this was a mistake. The membership of NFPA present at the voting agreed with using the term “deflagration” rather than “flash fire”.

   654-3

   I opposed the new section 6.1 on the basis that it is:
   1. incomplete
   2. requires the use of a computational assessment that relies upon a parameter whose numerical value we do not know,
   3. requires the use of a computational assessment that relies upon a parameter for which there is no current test method for determining its numerical value, and
   4. Establishes an acceptable level of employee injury that has not been determined to be acceptable to society.

   We all recognized that there was a problem with the 2006 edition in that it did not clearly establish what constituted an “explosion hazard” yet relied upon the phrase “where an explosion hazard exists...” to establish requirements for protection. We have been using the language in the current 6.2.3.1 to back into the determination of where an explosion
hazard exists in the building interior. But there is no explicit language in the document establishing what the TC deems constitutes an “explosion hazard”. This issue was addressed in Proposals 654-7 and 654-10. The ROP indicates that the issue was addressed by the committee by Accepting in Principal. No comment was made because the section on hazard determination was still in a state of flux during the comment period. But the new language in Section 6.1 of the proposed 2010 edition does not address anything but building compartments. So we are still in a situation where we have numerous requirements in Chapter 7 that rely upon the predicate phrase “where an explosion hazard exists” but nowhere does the standard clearly spell out what criteria one should use to determine if a vessel, duct, conveyor, bin bunker, silo, etc. constitutes an explosion hazard. How is the user supposed to know? Does a silo with 1% deflagrable (explosible) particulate mixed in with the big stuff constitute an “explosion hazard”? How about a pneumatic conveyance duct? We can’t expect the operator to perform a PHA to identify the hazards if we do not clearly establish what the TC deems a hazard.

This is an important issue as most of the post-event litigation ultimately boils down to whether the hazard was adequately recognized. Were the requirements of the nationally recognized standard of care, NFPA 654 observed correctly? When there is ambiguity in what constitutes an explosion hazard it is easy for the lawyers to argue that the requirements of Chapter 7 are not applicable. This is a big chink of work that just got forgotten while everybody was grappling with the implications of introducing the hazard assessment relations for the building interior spaces. Unfortunately, it makes the document incomplete.

But there are still problems with the algebraic relations (equations 6.1.2.1, 6.1.2.2, 6.1.3 and 6.1.4). This is not to say that conceptually the document isn’t headed in the right direction, it is, but we are not where we want or need to be yet.

I have a paper recycler with a 20,000 ft² (1,858 m²) facility, 32 feet floor slab to roof deck. The bulk density of the paper dust is approximately 5 lb/ft³. According to 6.2.3.1 of 654-2006 this operator is allowed a dust layer of 0.48 inches in depth. Under 654-2010, using the simple relations in 6.1.2.1 and 6.1.2.2, this operator is allowed 37 kg (82 lb) of dust in the facility for the personnel safety objective and 72 kg (159 lb) for the building structure objective. At 5 lb/ft³ this equates to a layer 0.0098 inches thick for the personnel objective and 0.019 inches thick for the structural objective! This is far less than the level permitted by the current 654. Do we have a loss history that justifies this 50-fold reduction in the permissible dust layer for personnel objective and 25-fold reduction for the structural objective? These relations, 6.1.2.1 and 6.1.2.2, treat all particulates the same regardless of the bulk density, net heat of combustion or KSt. consequently, they produce results that are excessively conservative when used for the majority of the particulates that we encounter.

Now this facility is operated by a client of mine and it actually had a deflagration in the process equipment which vented into the facility interior. The whole event was caught on videotape. There was no propagation of a deflagration fueled by the dust accumulations. I realize that one event does not constitute a trend. But this client has had two similar events at a second facility of the same size and neither of those resulted in propagation. So this client has some faith in 654-2006 but is not convinced that the limits in 654-2010 are valid.
So let’s use 6.1.3 and 6.1.4. $P_{\text{max}} = 6.6 \text{ bar}; C_w = 500g/m^3$. It’s a long-term lease of a spec building in an industrial park so we will assume a wall strength of 40 PSF and a DLF of 1.5 (worst-case). According to equation 6.1.3 $M_{\text{exp}} = \frac{17,583}{\eta D}$ grams. But what value do we use for $\eta D$? At Interfibe (another paper recycler that had a serious explosion several years ago) there were dust accumulations of 4 to 8 inches before the event (from contractor photos) and less than 1 inch after the event (scene documentation). At my client’s locations the 3 events we have investigated left the area near the vented deflagration clean – no residual dust. So I guess I shouldn’t use the “default value” but assume a worst-case limit of 1.00 for $\eta D$. For calculating the permissible dust layer for the structural objective that allows me 17.5 kg over the 1,858 m$^2$ area for a total of 9.46 grams per m$^2$. This is equivalent to .0046 inch thick layer if the layer is disturbed evenly over the entire interior. Even if I used the default value for $\eta D = 0.25$ we get a layer 4 times that thickness or 0.018 inches in thickness. This is far less than dust layer depths that did not produce a propagating deflagration in 3 out of 3 incidents. For the personnel safety objective, again setting $\eta D = 1$, I get .244.4 kg/$\eta D$ of dust permitted over the 1,858 m$^2$ area for a total of 131.5 g/m$^2$. At 5 lb/ft$^3$ this equates to 0.32 inch in depth, much closer to what I get using 654-2006. Yet this client has 3 events on videotape with dust depths greater than this number and there has been no evidence of deflagration extension into the building interior even though there appeared to be 100% dispersion. If I use $\eta D = 0.25$ I get a dust layer depth of 1.28 inches over the entire interior area. I cannot expect that much dust to not produce a propagating deflagration.

I understand that if the fugitive dust accumulations were limited to a fraction of the area of the facility that this computational method would allow for deeper dust layers in that fractional area. And that is a definite advantage, especially for the denser, more energetic dusts that pose a greater hazard and in process facilities where the fugitive dust layers occupy a fraction of the building. Less dense dusts tend to migrate further and a commensurately larger portion of the facility must be used in the area calculations. If I assume that the dust in the above example only occupies 25% of the total building floor area then the dust layer thickness becomes 5 inches, equal to what blew two employees out the end of the Interfibe building.

Something is wrong here. And there is NO ALTERNATIVE to using these relations in the proposed new standard.

In the current edition of the standard we have the simple measurement in 6.2.3.1 and if we don’t think the result is reasonable we can correct for bulk density and net heat of combustion and get a number that is more closely correlated to the actual dust in question. We have no loss history that I can find that suggests that the simple relation in NFPA 654-2006 is insufficiently conservative to allow for safe operations.

With the proposed new edition we have only one alternative, and that is to come up with a value for $\eta D$ other than the default value. Minor problem – there is no test method for doing that! Until we have a method for quantifying how much dust is going to be dispersed, regardless of the mechanism, and the fraction of the dispersed material that actually participates in the combustion process we are stuck. Without this information we cannot even use Chapter 5 to develop a hazard determination criterion.

That is why there is so much opposition to these relations right now. When we plug in data for real-life situations they lead to conclusions that are unachievable or are not.
supported by the loss history. Furthermore, the tools facility operators need to comply with the requirements that are laid-out in the proposed new standard don’t yet exist.

Before we can use this computational method we must have a method to quantify how much of an accumulated layer is dispersed, regardless of the actual mechanism. We must have a method to quantify how much of the dispersed dust actually burns. We must have a method to quantify the results of the combustion. Le Chatier’s principal tells us that when a chemical reaction does mechanical work it tends not to proceed to completion. Pressurizing a building and accelerating dust is mechanical work. Heating the dust up to AIT absorbs heat. In most of the event reconstructions I have done I find that the combustion process consumes the majority of the oxygen and becomes oxidant-limited. These factors all contribute to likelihood that the initial ignition will lead to a propagating deflagration.

We have not yet had the time to connect all of the dots. We have a partial computational model of what we expect to happen. Now we have to try to verify that model with event data to see if the model is a good predictor of the event. This hasn’t occurred. The initial “reality-checks” I have started with my event data suggests that there are unaddressed issues that we should address before we issue this document as the nationally recognized minimum-compliance standard of care.

The TC has used a 5% probability of flame impingement criterion in the personnel objective relations. As I remember Bob Zalosh’s presentation during the ROP meeting he used 5% as an example. Was it his intent that the TC simply embrace that number as the appropriate value? Is this number acceptable to the stakeholders at the site? Is it acceptable to the workman’s compensation insurance carrier, the owner and the employees? NFPA 654 should not stipulate what this acceptable loss level is – it should be left to the owner/operator and the other stakeholders in the site.

Finally, we need to keep in mind that this standard is not for us – we have been entrusted with writing it for the American public. It is supposed to be a hazard management tool that enforcement personnel, plant managers, facility engineers and consultants can used to manage the hazards encompassed by the scope statement. If we make the document too difficult to use we will make it irrelevant. OSHA is going to develop its own dust explosion hazard regulation which will permit the use of NFPA standards as a performance-equivalent alternative (I hope). We can make our document easy to use or hard to use. If it is easy to use then facility operators will use it and we have the ability to ensure that they are using methods that assure their employees and owners that the hazards are properly addressed. If we don’t, then the document that gets used will be written by some one else and we loose the leadership position. I don’t think there is a more competent, devoted group of people than our TC.

654-6

I moved adoption of comment # 654-33. When the TC decided to move the requirements for return air diversion to the section on air-material separators, a good idea, it managed to loose the requirement for return air diversion and, instead, required deflagration isolation. At Rochester Shoe Tree deflagration isolation was provided on the return air duct. When the dust collector caught fire, smoke, flame and burning filter media was conveyed back into the plant setting the plant on fire, burning 5 employees
and destroying the building. The deflagration isolation system, that is now required by the proposed new edition of 654 and manufactured by a firm that is represented on the TC, never operated. That’s because the deflagration isolation system relies upon pressure sensors for actuation. During a dust collector fire the needed pressure rise does not occur. Furthermore, even if it did actuate, the deflagration isolation system does not provide sufficient agent to offset the nominal 10-25 MW heat release rate of a dust collector fire. Indeed, the Listing of deflagration isolation systems does not contemplate the prevention of flame from vessel fires, only the transitory flow of deflagration flame front.

The only effective means of managing the fire hazard associated with the return of cleaned air from a dust collector is with return air diversion using abort gates. The overwhelming majority of the dust collector explosions we see start off as dust collector fires which transition to deflagration when the automatic bag cleaning feature operates. Only a fraction of the dust collector fires end up as explosions. Accepting Comment 654-33 would fix this error.

654-8

I moved that the membership accept proposal 654-7 and 654-10. These two proposals establish definitions for “deflagration hazard” and “explosion hazard” so the requirements in Chapter 7 would actually have an explicit definition to rely upon. These motions were tabled during the annual meeting pending the outcome of the vote on 654-9.

654-9 submitted by Sam Francis, AF&PA

I support this motion. There are numerous interdependencies and cross-references within this document. If selected motions to amend are accepted without returning the entire document to the technical committee there is a very real possibility that a disjointed, internally inconsistent document would result, precipitating the need for any number of Tentative Interim Amendments.

4. Statement of Relief Requested.

Return the entire 654 report back to committee. There are enough problems with the proposed document that a piece-meal repair is not practical and would likely lead to a document that is either internally inconsistent or incompletely addresses the fire and explosion hazard management issues.
I think we got wrapped around the axle on this one. If you can't see the substrate underneath a layer of dust, it is too much dust. Bulk density and all that aside, this is all anyone really needs to know to make a safe decision.

Guidance for first-pass visual evaluation could be by the old 1/32 inch, corrected for settled bulk density, or "surface just discernable under dust layer".

If first-pass screening fails the user/enforcer could move forward to equations 6.1.3 and 6.1.4. to determine housekeeping requirements.

Committee Meeting Action: Reject
Committee Statement: The Committee believes that the proposed change to the name of the definition does not adequately clarify the issues raised and does not tie in with how the defined term is used within the document. See Committee Comment 654-10 (Log #CC25) for further information on the Committee's action to clarify this concept.

Number Eligible to Vote: 29
Ballot Results: Affirmative: 24 Negative: 4
Ballot Not Returned: 1 Floyd, L.

Explaination of Negative:

CHASTAIN, B.: The definition does not allow the user or the regulator to visually determine if a "dust fire hazard" exists in a building. Additionally, the term "dust fire hazard" is misleading and should be replaced with "dust deflagration hazard" to be consistent with terminology used for the last five + years that the user community understands.

CHOLIN, J.: The definition the TC has settled on does NOT provide the user or enforcer with explicit criteria that can be used to distinguish a hazardous area from any other area by visual inspection. Furthermore, the words "dust fire" do not connote the severity of the hazard. Most people think they can outrun a fire whereas few individuals in a facility during a deflagration are successful in being able to react fast enough to save themselves from serious injury. The use of the term "fire" connotes in the minds of most readers a hazard far less severe that the term "deflagration". The adoption of the definition as finally proposed by the TC will serve to mislead the readers of the document and lead to an under-assessment of the severity of the hazards to personnel.

The language reflected in the ballot is NOT what the majority of the TC adopted during its 2 day meeting in Baltimore. During that meeting the TC adopted the use of the term "deflagration" rather than "dust fire" and "flash fire" because there was a 40-year history of using the term deflagration, the term "deflagration" is used in all of the other NFPA dust standards as well as the model building codes and the term connotes something that is very different from the "fire" that conventional fire protection assets are designed to address. Then the TC continued its meetings with a series of teleconferences that were scheduled on such short notice that only a fraction of the committee was free to participate. The ballot reflects decisions made by this small fraction. The practice of revisiting these definitions in the context of teleconferences scheduled such that only a fraction of the TC could participate deprived the full committee of the opportunity to participate in the discussions and the voice vote. This is NOT what is intended in the Rules Governing Committee Projects and erodes the integrity of the NFPA Codes and Standards writing process.

KIRBY, D.: The definitions for dust fire hazard area and dust explosion hazard area does not allow the user/enforcer to visually determine (as a first level screening) whether or not a hazard exists. Instead of sweeping and weighing, (as a first-pass screening), guidance should be given on visually determining whether or not additional evaluation is needed. If first-pass screening fails the user/enforcer could move forward to equations 6.1.3 and 6.1.4. to determine housekeeping requirements. Guidance for first-pass visual evaluation could be by the old 1/32 inch, corrected for settled bulk density, or "surface just discernable under dust layer".

STEVenson, B.: The definitions for dust fire hazard area and dust explosion hazard area does not allow the user/enforcer to visually determine (as a first level screening) whether or not a hazard exists. Instead of sweeping and weighing, (as a first-pass screening), guidance should be given on visually determining whether or not additional evaluation is needed. If first-pass screening fails the user/enforcer could move forward to equations 6.1.3 and 6.1.4. to determine housekeeping requirements. Guidance for first-pass visual evaluation could be by the old 1/32 inch, corrected for settled bulk density, or "surface just discernable under dust layer." I think we got wrapped around the axle on this one. If you can't see the substrate underneath a layer of dust, it is too much dust. Bulk density and all that aside, this is all anyone really needs to know to make a safe decision.
Technical Committee on Handling and Conveying of Dusts, Vapors, and Gases,

***Include-LCP4-Rec***

The current building codes do not establish when a building or room must be protected against a dust explosion. Nor do they set the allowable quantity of a hazardous (combustible) dust in a control area, above which automatic fire suppression is required. Similar to NFPA-30 for liquids, NFPA-654 should establish these limits for dusts. Also, similar to NFPA-30, NFPA-654 should establish an acceptable amount of material in process, in this case, escaped dust.

This proposal clarifies when a Dust Explosion hazard and a Dust Fire Hazard exist in an operation handling combustible dust. The current text mentions these situations but provides no quantitative method to determine how much dust or what distribution of dust results in the hazard. In addition, the current text does not clearly differentiate between dust accumulations requiring electrical classification or those presenting a dust explosion hazard.

This proposal does not set a maximum amount of dust accumulation in a facility. Instead, just as for other materials, it establishes additional protection requirements when a certain amount of accumulation is exceeded.

The criteria for a dust explosion hazard is based on the ability to produce overpressure sufficient to cause building structural failure in the absence of some explosion protection method, typically venting. This is based on the worst case dust concentration, meaning that concentration and its associated maximum deflagration pressure, \( P_{\text{max}} \), which give the largest building fill fraction. The worst case fill fraction would come from NFPA-68, section 8.3.4.

The criteria for a dust fire hazard area is based on local fugitive dust accumulation exceeding a mass of 1 kg/m\(^2\) on a single square meter of surface between routine scheduled cleaning. This amount of dust, if dispersed, could create an exploisable dust cloud of 2 to 4 meters height in a local area. Such a cloud would present a potential for a flash fire with personnel injury as well as ignition of other combustibles. Engineered dust collection and a sufficient routine housekeeping schedule can minimize dust fire hazard areas. When fugitive equipment leaks, then a local accumulation exceeding the 1 kg/m\(^2\) criteria between scheduled general cleaning would be cleaned up in shorter times as the local accumulation rate increases.

A small dust fire hazard area would require manual fire protection. If the process results in more than 5% of the fire-separated area (room or floor) exceeding the criteria between routine cleaning, effectively a minimum average of 0.05 kg/m\(^2\) or 10%-20% of the MEC, the entire area would be protected with automatic fire suppression. This includes all the areas which experience short term accumulations beyond 1 kg/m\(^2\) in a typical 24 hour operation, the longest allowed local cleaning period.

The need for electrically classified equipment for ignition prevention is clearly separated from the explosion and fire hazards. The dust layer thickness, that is accumulation, used to determine electrical classification, is different than those for provision of automatic fire suppression or explosion protection.

Committee Meeting Action: Accept
Number Eligible to Vote: 28
Ballot Results: Affirmative: 20 Negative: 3
Ballot Not Returned: Barton, J., Gillis, J., Hunter, R., Hurst, G., Ness, A.

Explanation of Negative:

CHOLIN, J.: The proposal introduces the term "dust fire" which is not defined nor is it distinguished from the term "deflagration" that has been used for decades in this and numerous other NFPA documents. The submitter has not substantiated the need or advisability for introducing this new term.

The committee proposal is too complex to be routinely enforced by non-engineers for determining if a hazard exists or not. The proposed material should be included in an annex to Chapter 5 as a manual of practice.

The committee proposal calculations rely on the concentration producing the maximum pressure, not the minimum concentration that propagates a deflagration flame front, MEC. This leads to under-assessment of the hazard.

SUTTON, J.: While I agree with the concept of establishing hazard areas based on the amounts of dust, I do not agree with using an entrainment factor of 0.25 in these equations as this would result in an increase in the amount of dust allowed in an area and there is not an adequate technical basis for using a 0.25 entrainment factor.

URAL, E.: Change eta\(_D\) value to 1.0 for elevated deposits, and 0.25 for ordinary floor deposits

Comment on Affirmative:

BEATTIE, W.: The .25 factor is not substantiated. This may permit higher than acceptable levels of dust. If any factors...
less than 1 is used, the use of the factor should be substantiated by tests.
Add the following new definitions:

3.3.x Dust explosion hazard volumes: those room or building volumes where an unvented deflagration of the entrainable dust mass can result in a reduced pressure, $P_{red}$, exceeding the ultimate dynamic strength of the weakest structural element not intended to fail.

3.3.x Dust fire hazard areas: those areas where combustible dust accumulation on exposed or concealed surfaces, outside of equipment or containers, can result in personnel injury from thermal dose during a dust deflagration, as well as areas where dust clouds of a hazardous concentration exist during normal operation.

Replace existing 6.1 with the following and renumber as needed:

6.1 General. The provisions of this section shall apply to the overall design of systems that handle combustible dusts.

6.1.1* Those portions of the process and facility where a dust explosion hazard or fire hazard exists shall be protected from the effects of these hazards in accordance with this section as well as Sections 6.2, 6.3, and 6.4 and Chapter 7.

6.1.2* Unless supported by calculations per 6.1.3 and 6.1.4, respectively, dust explosion hazard volumes and dust fire hazard areas shall be deemed to exist when total accumulated dust mass exceeds 1 kg/m² multiplied by 5% of the building or room footprint.

A.6.1.2 This is equivalent to 0.8 mm ($1/32$ in.) based upon a settled bulk density of 1200 kg/m³ (75 lb/ft³). The following equation provides a means to estimate an equivalent depth from a known value of settled bulk density.

\[ \text{Equivalent Depth} = \frac{0.8 \text{ mm}}{\text{Bulk Density (kg/m³) or (lb/ft³)}} \]

6.1.2.1 All dust accumulated on structures above the lowest footprint shall be evaluated as if accumulated on the lowest footprint.

6.1.2.2 The maximum footprint to be used to calculate the total dust mass shall not exceed 2000 m².

6.1.3 It shall be permitted to evaluate the threshold dust mass establishing a building or room as a dust explosion hazard volume, $m_i$, per equation 6.1.3.

where

**Insert Equation E654-20 Here**

**Insert Equation E654-21 Here**
$M_{exp}$ is the threshold dust mass (g) based upon building damage criterion,
$c_w$ is the worst case dust concentration (g/m$^3$) at which the maximum rate-of-pressure-rise results in tests conducted per ASTM E1226,
$P_{red}$ is the allowable pressure (bar g) developed during a deflagration per NFPA 68,
$P_{max}$ is the maximum pressure (bar g) developed in ASTM E1226 tests with the accumulated dust sample,
$A_{floor}$ is the enclosure floor area (m$^2$),
$\eta_D$ is the entrainment fraction
and H is the enclosure ceiling height (m).

6.1.4 It shall be permitted to evaluate the threshold dust mass establishing an area as a dust fire hazard area, per equation 6.1.4

****Insert Equation E654-22 Here****  Eqn 6.1.4

Where, $M_{fire}$ is the threshold dust mass (g) based upon personnel fire exposure criterion.

6.1.5* It shall be permitted to assume a default value of 0.25 for the entrainment fraction ($\eta_D$).

A 6.1.5 A higher value for $\eta_D$ is more appropriate for ducts and small enclosures less than 100 m$^3$ and for enclosures with L/D ratios greater than 5, such as galleries. Research activities are currently in progress to define a technical basis for estimating $\eta_D$.

6.1.6 It shall be permitted to use a lower value of $\eta_D$ based on a risk evaluation that is acceptable to the authority having jurisdiction.

6.1.7 Dust accumulation amounts shall reflect the conditions resulting from routinely scheduled cleaning, and not include short term accumulations cleaned in accordance with Chapter 8.
Equation A.6.1.2

\[
\text{Equivalent Depth (mm)} = \frac{1000 \cdot \text{Accumulation (kg/m}^2\text{)}}{\text{BulkDensity (kg/m}^3\text{)}}
\]

Equation 6.1.3

\[
\text{Equivalent Depth (mm)} = \frac{1000 \cdot \text{Accumulation (kg/m}^2\text{)}}{\text{BulkDensity (kg/m}^3\text{)}}
\]

Equation 6.1.4

\[
M_{\text{fire}} = 0.05 \left[ \frac{C_w}{1 + P_{\text{max}}} \right] A_{\text{Floor}} \frac{\delta}{\eta_D}
\]
proceed with the certified amending motions.

SHANE CLARY: Thank you, Mr. Frank.

We'll now proceed with discussions on the certified amending motions for NFPA 654. We'll begin with 654-1 and it looks like Microphone No. 1.

JOHN CHOLIN: Mr. Chairman, my name is John Cholin with JM Cholin Consultants. I'm speaking on behalf of myself only and I'm a member of the committee, and I move to accept Comment 654-5.

SHANE CLARY: Okay. We have a motion on the floor to accept comment 654-5. Do we have a second.

(Second.)

SHANE CLARY: There was a second.

Mr. Cholin, please proceed.

JOHN CHOLIN: This comment seeks to maintain consistency amongst several NFPA dust documents. For decades, the NFPA documents that deal with dust explosions have used a common definition for the term "deflagration."

The term "deflagration" has been incorporated in model building codes, has been taught in numerous venues for many, many years. Indeed we have a 30-year history of using the term and the definition has been essentially uniformly adopted over numerous technical committees.
During the ROP meetings, new language was introduced which include the term "dust fire" and "dust flash fire." This Comment seems to return to the use of the term "deflagration." The term "dust fire" and "dust flash fire" are not defined in the document. The term "dust fire" does not connote the severity of the life safety threat potentially posed by the facility handling combustible dust.

A pile of dust might be ignitable and represent a very small fire hazard. However, when that dust is suspended in air, it produces deflagration which propagates through the space oftentimes severely injuring the occupants.

The use of the term "dust fire" or "dust flash fire" connotes far grave -- far less of a hazard than the term "deflagration." Minimizing the hazard by using the term "dust fire" or "dust flash fire" does not serve the public safety.

I ask the membership to return the term "deflagration" to the document and accept Comment 654-5.

SHANE CLARY: Okay. Thank you.

Mr. Frank.

WALTER FRANK: Mr. Chairman, on behalf of the committee that voted 24 to 4 in opposition to the proposal, I'm speaking opposition to the motion.
The submitter asserts that his proposed change will make NFPA 654 more consistent with current terminology. It's the committee's opinion, however, that the proposed revision to 654 that we've prepared is more consistent with the general use of the term "deflagration" both within NFPA documentation and with its use in general industry.

NFPA 654 has to address three combustion hazards: Fire, settled layers of dust, flash fires and suspended dust clouds, and explosions that can result when those burning extended dust clouds are confined in a way that will produce damaging overbrushes.

All three of those events are deflagrations.

NFPA 68 defines deflagration as a propagation of a combustion zone in a velocity that is less than the speed of sound in the unreacted medium. And I'll note NFPA 658 is the governing document for that definition. That definition is consistent with the general use of deflagration in the literature in industry.

The motion, if approved, would propagate an error within the 2006 edition of NFPA 654. In that edition, we tried to make a distinction between flash fires and explosions by referring to flash fires as deflagration hazards and by referring to explosions as explosion hazards. But, again, both events, both flash
fires and explosions result from a deflagration.

The committees concern was that to continue to propagate this error was going to continue the confusion over what was meant by deflagration.

SHANE CLARY: Okay. Thank you, Mr. Frank.

WALTER FRANK: The motion, if adopted, would place the 654 in conflict with NFPA 68, and I can cite another -- well, as far as the use of the term -- these terms and other NFPA documents, both NFPA 1 fire code and NFPA fire protection handbook refer -- defer, rather, to NFPA 68 for the definition of deflagration and NFPA 654 in our proposed modification revision is consistent with the NFPA 68 definition.

As far as the assertion that the term "deflagration" has been removed from the standard, it has not been removed from the standard. The usage of the term "deflagration" has been clarified consistent with industry practice and other NFPA standards in the proposed revision to the standard.

The assertion that NFPA 654 introduces the term "dust fire," that's not exactly correct. We talk about dust flash fire. I think there was an assertion that that's an uncommon term.

Looking through NFPA publication, NFPA 921, defines flash fire to include dust as a fuel. NFPA 2112
and 2113 use the NFPA 921 definition of flash fire that references dust as a fuel and the scope statement of the document specifically refer to dust flash fires.

NFPA 1951 uses the NFPA 921 definition of flash fire. NFPA 1991 refers to dust or particulate flash fires. NFPA 44 makes a distinction between the hazards associated with flash fires and explosions involving dust, the same distinction we were trying to make in 654. NFPA 704 discusses flash fires from varying dust clouds.

So in summary, the committee does not believe that the proposed changes to the terminology proposed in this motion will add to the clarity of NFPA 654. We feel that our carefully considered revision to the document will add clarity to the use of the terms "deflagration," "flash fire," and "explosion."

And, again, flash fires and explosions are both result from -- result in deflagration and deflagration is the more general term. Thank you.

SHANE CLARY: Okay. Thank you.

And we will now proceed with discussion on the motion before us, and it looks like Microphone No. 5, please.

SAM FRANCIS: Sam Francis, American Wood Council, and speaking for the American Forest and Paper
Association on this issue.

   Frankly, using other words to describe subsets of a broader term, in this case deflagration, I think is, in fact, removing the term from the code.

   Mr. Cholin's Comment I believe is right on target. It will, in fact, make this in -- conflict and set apart from among other things model building codes that rely upon this standard for continued enforcement.

   Now, using the other terms which describe a subset of a deflagration, things like dust flash fire, within the body of the document doesn't negate the definition of deflagration. It's the broader term. I agree -- in fact, I thought the chair eloquently argued in favor of this amendment.

   I support Mr. Cholin's motion, I think it should be continued, and it's part and parcel to several other more substantive changes that will occur and there are motions on -- later you'll notice that this one is a relatively debated one. We support the motion.

   SHANE CLARY: Okay. Thank you.

   And Microphone No. 2, please.

   ERDOM URAL: Oh, that's me.

   SHANE CLARY: That is you. Don't need to touch the mic.

   ERDOM URAL: Oh, don't touch the mic.
SHANE CLARY: Step away from the mic.

(Laughter.)

ERDOM URAL: Good afternoon, everybody. My name is Erdom Ural. I work for FM for 16 years and KITA (phonetic) for four years and occasionally WIPI (phonetic) as an adjunct professor and I'm also an independent consultant and I'm speaking solely on behalf of me. And I am hear to support the committee's action and I'd like to speak against the NITMAM.

I just wanted to give you guys -- we have heard both sides of the issue. I just wanted to bring to the attention of this group what is inspire committee to bring up the word of "flash fire" into the document. It's exactly -- actually exactly what Mr. Cholin is saying. The committee felt that most users of this document, including the workers, authorities having jurisdiction. When you talk about deflagration, they don't really know what we are talking about.

We say deflagration and they say gesundheit. For us in the fire protection field, deflagration is a term of propagation of the flame and a premixed fuel air mixture, so it's a well defined term. It means something to us but not to most common users of the standard.
And I -- the committee felt that the flash fire is a more like a warning or a danger word to the workers out there. And I also agree that the document now clear which specifies that the two major hazards, the standards are concerned about is a flash fire and explosion and then the mechanism flame propagation mechanism for those are -- is deflagration for those who want to know better. But the main concern is deflagration and flash fire.

And Mr. Frank already talked about the assertion of the change, putting the document in conflict with the other NFPA standard, but that allegation is totally false and there is plenty of uses of the -- therefore, the flash fire and the other NFPA standards. Thank you.

SHANE CLARY: Thank you.

Microphone No. 1, please.

DAVID WECHSLER: Good afternoon. My name is David Wechsler. I'm speaking for the motion. I'm a global process safety leader with the Dow Chemical Company.

I'm a user and we happen to make materials that use -- that are considered combustible dust both in the floor term before we started working with what was a combustible dust, throwing around some new terms and new
technologies in other areas, and in my opinion relatively going way beyond to confusing people.

Looking from the record of what was done from 654, in Comment 654-10, the record reflects that the replacement term of "deflagration" with "explosion" stated in the substantiation was whenever the consequences from the hazard results from thermal exposure, it will be referred to as a flash fire hazard. And whenever the consequences from the hazard results in an overpressure, it will be referred to as an explosion hazard.

I submit to you that the fire -- flash fire condition is an extraction from NFPA 2113, and it deals with a fire that spreads rapidly without protection of damaging pressure.

The term "deflagration" is appropriate, has been in use, and in my opinion what is being carried forth by 654 is not in the direction of goodness and it does in support of what the chairman has said really does go to the issue of supporting Mr. Cholin. Thank you.

SHANE CLARY: Thank you.

And Microphone No. 2, please.

BILL STEPHENSON: My name is Bill Stephenson.

I'm vice president of engineering for CB Technology. My
company is in the dust explosion prevention business. I am a member of the committee. I would like to point out a couple of things.

First of all --

SHANE CLARY: Are you speaking for it or against the motion?

BILL STEPHENSON: I'm sorry. I'm speaking against the motion.

SHANE CLARY: Thank you. You may proceed.

BILL STEPHENSON: Thank you.

First of all, if you look in the definitions at the beginning of the document, you'll find the word "deflagration" included. I think that sort of speaks to that issue.

Secondly, if you look at the name of the document, you'll notice that right at the beginning it is a standard for fires and explosions. The effort of the committee was to make sure that the users of the document would be able to understand the difference and the necessity of addressing those two separate risks separately because often the requirements are different for the two separate hazards. Thank you.

SHANE CLARY: Thank you.

Any further discussion on Motion 654-1?

And, yes, Microphone No. 5.
BRICE CHASTAIN: I'm Brice Chastain. I work for Georgia Pacific Corporation, and I'm a member of the 654 committee. I recall attending one of our meetings -- technical meetings in Baltimore --

SHANE CLARY: Are you speaking for or against the motion?

BRICE CHASTAIN: I'm speaking for the motion.

SHANE CLARY: Thank you. Please proceed.

BRICE CHASTAIN: I recall attending a meeting in Baltimore where the committee discussed this issue. Erdom Ural brought it up for vote, and it was voted down during that meeting. I guess the record will show that. Subsequently, there was several teleconferences discussing various issues, including the new mass equations, and these teleconferences were -- were very short as far as notifying the members who would be participating. I was not able to participate in some of those due to being out of the country and some of the other members were not also.

Subsequently, during one of these teleconferences, Erdom Ural brought up this issue again for vote and it was voted to accept the terminology during a subsequent teleconference. I just would like to make that noted.

SHANE CLARY: Okay. Thank you.
Microphone No. 1.

JOHN CHOLIN: Mr. Chair, my name is John Cholin again and I'm speaking in favor of the motion. For the benefit of the membership, the term "deflagration" that we're talking about is not the overarching term that's in the definitions by itself.

It's the use of when we're identifying hazards, we -- they remove the term "deflagration" from the definition of the deflagration hazard and replaced it with flash fire. And that is what my motion is, is to put the term "deflagration" back into the definition of a deflagration hazard. I just want to make sure the membership understands that.

SHANE CLARY: Okay. Thank you.

Any further discussion on the motion --

WALTER FRANK: Mr. Chairman, may I speak again?

SHANE CLARY: Mr. Frank, please proceed.

WALTER FRANK: I feel that I'm compelled to respond to the comments about the scheduling of the teleconferences. As we proceeded with this, this project it turned out to be, it grew in size and scope and complexity and detail and yes, we had to have some teleconferences.

I think NFPA staff would speak authoritatively that we scheduled these meetings appropriately with
ample knowledge. Unfortunately, it's not always possible to get a hundred percent of attendance at any meeting or teleconference, but there was nothing inappropriate about the way the teleconferences were scheduled, and I want to be emphatic about that.

As far as the issue of -- I mean, I'm now starting to get confused myself about how many ways the submitter is using the word "deflagration." But we do define deflagration in the standard as the NFPA 68 definition.

The deflagration -- I'll repeat myself, all of the combustion related events that NFPA 654 is charged with protecting against are deflagrations. To try to use deflagration to single out one type of combustion event to try to emphasize the seriousness of the event is -- it does not achieve the intent.

Let's face it, a candle flame is a deflagration. It's a flame propagating through the unburned material that is speed less than the speed of sound in the unburned material.

I'm not terribly afraid of candlelights. Using the word "deflagration" is not doing -- inspire a particular sense of urgency to the -- to many of the different types of combustion events that are deflagrations. Yes, we tried to emphasize flash fire
and we tried to emphasize explosion. Both of them are
deflagrations.

But when it came to talking about areas of the
building that present a flash fire hazard, we felt that
that terminology communicated -- would communicate the
proper message to the people who need to be aware of the
hazard in that area.

When we use the term "explosion hazard" --
"dust explosion hazard," we use the term purposely to
communicate that sense of urgency. Trying to substitute
"deflagration" for "dust flash fire" to me and to the
committee does not communicate the sense of urgency or
concern that people in facilities that are exposed to
dust combustion hazards should be aware of. Thank you.

SHANE CLARY: Thank you.

Microphone No. 2, Chief Black.

ART BLACK: Good afternoon, Mr. Chair. Art
Black, Carmel Fire Protection, I call the question.

SHANE CLARY: Okay. Can we have a second.

This motion is non-debatable. All in favor of
calling the question, please signify by raising your
hand.

(Raising hands.)

SHANE CLARY: All opposed same sign.

Motion carries. We now immediately move to the
motion on the floor which is to accept Comment 654-5.

All in favor of the motion, please signify by raising your hands.

(Raising Hands.)

SHANE CLARY: Thank you.

All opposed?

(Raising Hands.)

SHANE CLARY: The motion carries.

The next motion appeared on our agenda; however, the authorized maker of the motion (indiscernible) representative has notified NFPA that they no longer wish to present this motion. Therefore, in accordance with NFPA rules and convention rules 2.6, the motion may not be considered by the assembly and removed from the agenda.

We will now move to the next agenda item which is 654-3. 654-3.

And Microphone No. 1.

JOHN CHOLIN: Mr. Chairman, John Cholin from JM Cholin Consultants, independent consultant speaking -- representing myself, a member of the committee, and I am moving acceptance of the motion to return the identifiable part identified as Section 6.1 to the committee for reconsideration.

The proposed new section 6.1 --
June 29, 2010

Filed by:

Walter Frank, P.E.
Frank Risk Solutions, Inc.
1110 Shallcross Ave
Wilmington, DE 19806
302-521-7588

Action being appealed:

I am appealing the action taken at the 6/9/10 NFPA Technical Meeting which passed motion 654-1.

Grounds for the appeal:

I am the chair of the Technical Committee on Handling and Conveying of Dusts, Vapors, and Gases, the TC responsible for NFPA 654.

While I am filing this appeal on my own behalf, I do so out of respect for the dedicated effort devoted by over 25 industry experts as they labored for the last two years to update NFPA 654. It should be noted that the TC voted in overwhelming support of the revised standard draft presented at the June 9, 2010 Technical Meeting.

I am appealing the decision to pass motion 654-1. I do so because I believe the vote taken at the Technical meeting did not adequately consider the technical merits of the issues underlying the motion and the changes that it sought to prevent being made to NFPA 654.

As technical substantiation, I am attaching excerpts from the statement that I filed today with my ballot on the NFPA 654 Amendment to Return Entire Report.

In summary, the Motioner sought to prevent clarifications that the TC made in the use of the term “deflagration” and the introduction of a new term “dust flash fire.” After considering the opinions of the Motioner in committee meetings, the TC voted almost unanimously to adopt the language proposed in the draft standard. In doing so, the TC determined that the alternative language proposed by the Motioner was not consistent with standard usage within NFPA and other industry publications, and that the language approved by the TC more effectively communicated the hazards associated with the handling of combustible dusts. Details are provided in the attachment.
While I am sure the TC could further improve 654, I still believe that the TC has made major improvements in the document. I am proud enough of our work to believe that workers and companies would be better protected if our version of 654 were released. Regrettably, that release may now be delayed. So, in addition to the technical substantiation, I would like to add that I am gravely concerned that needless fatalities will result as a consequence of such a delay.

Relief requested:

I request that the Standard Council overrule the action taken at the June 9, 2010 Technical Meeting; i.e., overrule the approval of motion 654-1 and restore the use of the terminology approved by the TC.

W. L. Frank, P.E.
Technical Substantiation:

Use of the term “deflagration” and “dust flash fire”: The TC voted overwhelmingly in support of the usage that we settled upon for these terms. Those speaking against the 654 draft contended that our use of the terms “deflagration” and “dust flash fire” were inconsistent with standard NFPA usage and that “deflagration” should be used in place of “dust flash fire.”

NFPA 68 (Standard on Explosion Protection by Deflagration Venting, the document which “owns” the term “deflagration”) defines a deflagration as:

“Propagation of a combustion zone at a velocity that is less than the speed of sound in the unreacted medium.”

This definition is consistent with the usage in the SFPE Handbook of Fire Protection Engineering, the NFPA Fire Protection Handbook, and other industry publications such as those of the American Institute of Chemical Engineers, Center for Chemical Process Safety. NFPA 1, Fire Code refers to the NFPA 68 definition. The TC believes that our usage of the term “deflagration” is consistent with its usage in NFPA 68, and these other NFPA and industry references.

NFPA 654 must address three types of combustion hazards: fires in settled layers of dust; flash fires in suspended dust clouds; and explosions that can result when such burning dust clouds are confined in a way that allows pressure to build up. All three of these combustion events are deflagrations, consistent with the use of the term as defined by NFPA. Consequently, the TC elected to use the term “deflagration” as a more generic term to address the entire class of combustion events, while using more specific terms to focus on the different modes of combustion, and to more effectively communicate the severity of the consequences associated with the particular events.

Of particular importance in the revised standard was the need to draw the distinction between:

1. Situations involving rapidly burning and expanding combustible dust clouds where the consequence of concern is that personnel can be engulfed in, and injured by, thermal exposures from the resulting fireball, and

2. Situations where such burning dust clouds are confined in a way that pressure can build to levels that can damage enclosures, including rooms, and personnel can be injured by the physical damage that results when the enclosure bursts.

The TC, consistent with normal usage of the terms, elected to refer to the first event as a “dust flash fire” and the second as an “explosion.”
The Motioner contended that the term “dust flash fire” did not adequately communicate the gravity of the event and proposed that the term “deflagration” should be used instead. To do so, in the opinion of the TC, would risk confusion between the two phenomena: dust flash fires (which the Motioner wants to call “deflagrations”) and explosions (which are also deflagrations). Contrary to the Motioner’s contention, the TC actually felt that the term “dust flash fire” was more evocative of the nature, and the acute severity of the potential consequences, of the event than the more general (and more drily “scientific”) term of “deflagration.”

Note that the NFPA 68 Committee also thought most people did not appreciate the severity of the term deflagration. That is why the title of NFPA 68 was changed to include the word “explosion” in the 2007 edition. In other words, the Committee qualified the phrase "Venting of Deflagrations" in the title by changing it to "Explosion Protection by Deflagration Venting" in the 2007 edition.

All of the above was communicated during the Technical Meeting, along with the fact that the TC overwhelmingly believed that “dust flash fire” was the better, and more communicative, term to use to imbue the distinction between the two events (fireballs and overpressure events) in the minds of the users of the standard.

The Motioner also contended that the term “dust flash fire” was not in common usage within NFPA publications. As communicated during the Technical Meeting, there is adequate precedent within NFPA publications for the use of the term “dust flash fire.”

- NFPA 921 defines “flash fire” to include dust as a fuel.
- NFPA 2112 and 2113 use the NFPA 921 definition of “flash fire” – and the scope statements of the documents specifically refer to “dust flash fires.”
- NFPA 1951 uses the NFPA 921 definition of “flash fire.”
- NFPA 1991 refers to “dust or particulate flash fires.”
- NFPA 484 makes the distinction between the hazards associated with flash fires and explosions involving dust.
- NFPA 704 discusses flash fires from burning dust clouds.

In summary, the TC – through its overwhelming support of the proposed terminology – did not believe that the alternate use of terminology proposed by the Motioner was consistent with general usage of the terms, within and beyond NFPA publications, and did not adequately communicate the gravity of the events sought to be described.
1. Name: John M. Cholin, P.E.

Affiliation: J.M.Cholin Consultants, Inc.

Address: 101 Roosevelt Dr.
Oakland, NJ 07436-2008 USA

2. This action relates to Motion Sequence Numbers:
   - 654-1 to restore the term “Deflagration” in lieu of “Flash Fire” in the document
   - 654-3 to return Section 6.1 back to the Technical Committee
   - 654-6 to accept Comment 654-33, and
   - 654-8 accept proposal 654-7 and 654-10, submitted by John M. Cholin, P.E., J.M.Cholin Consultants, Inc. and,
   - 654-9 submitted by Sam Francis, AF&PA to Return Entire Report back to committee.

3. Argument setting forth grounds for appeal:

654-1

I moved to replace the “dust flash fire” terminology with “dust deflagration” terminology. During the ROP meeting the TC voted to do this. The justification was that the fire protection engineering and building code enforcement communities have an understanding of what a deflagration is and there is a benefit to remaining consistent with this terminology. However, I am told that during one of the subsequent teleconference meetings (I was teaching during the first and did not receive any advanced notice of the second) it was moved to switch it back. I believe that this was a mistake. The membership of NFPA present at the voting agreed with using the term “deflagration” rather than “flash fire”.

654-3

I opposed the new section 6.1 on the basis that it is:
1. incomplete
2. requires the use of a computational assessment that relies upon a parameter whose numerical value we do not know,
3. requires the use of a computational assessment that relies upon a parameter for which there is no current test method for determining its numerical value, and
4. Establishes an acceptable level of employee injury that has not been determined to be acceptable to society.

We all recognized that there was a problem with the 2006 edition in that it did not clearly establish what constituted an “explosion hazard” yet relied upon the phrase “where an explosion hazard exists...” to establish requirements for protection. We have been using the language in the current 6.2.3.1 to back into the determination of where an explosion
hazard exists in the building interior. But there is no explicit language in the document establishing what the TC deems constitutes an “explosion hazard”. This issue was addressed in Proposals 654-7 and 654-10. The ROP indicates that the issue was addressed by the committee by Accepting in Principal. No comment was made because the section on hazard determination was still in a state of flux during the comment period. But the new language in Section 6.1 of the proposed 2010 edition does not address anything but building compartments. So we are still in a situation where we have numerous requirements in Chapter 7 that rely upon the predicate phrase “where an explosion hazard exists” but nowhere does the standard clearly spell out what criteria one should use to determine if a vessel, duct, conveyor, bin bunker, silo, etc. constitutes an explosion hazard. How is the user supposed to know? Does a silo with 1% deflagrable (explosible) particulate mixed in with the big stuff constitute an “explosion hazard”? How about a pneumatic conveyance duct? We can’t expect the operator to perform a PHA to identify the hazards if we do not clearly establish what the TC deems a hazard.

This is an important issue as most of the post-event litigation ultimately boils down to whether the hazard was adequately recognized. Were the requirements of the nationally recognized standard of care, NFPA 654 observed correctly? When there is ambiguity in what constitutes an explosion hazard it is easy for the lawyers to argue that the requirements of Chapter 7 are not applicable. This is a big chink of work that just got forgotten while everybody was grappling with the implications of introducing the hazard assessment relations for the building interior spaces. Unfortunately, it makes the document incomplete.

But there are still problems with the algebraic relations (equations 6.1.2.1, 6.1.2.2, 6.1.3 and 6.1.4). This is not to say that conceptually the document isn’t headed in the right direction, it is, but we are not where we want or need to be yet.

I have a paper recycler with a 20,000 ft² (1,858 m²) facility, 32 feet floor slab to roof deck. The bulk density of the paper dust is approximately 5 lb/ft³. According to 6.2.3.1 of 654-2006 this operator is allowed a dust layer of 0.48 inches in depth. Under 654-2010, using the simple relations in 6.1.2.1 and 6.1.2.2, this operator is allowed 37 kg (82 lb) of dust in the facility for the personnel safety objective and 72 kg (159 lb) for the building structure objective. At 5 lb/ft³ this equates to a layer 0.0098 inches thick for the personnel objective and 0.019 inches thick for the structural objective! This is far less than the level permitted by the current 654. Do we have a loss history that justifies this 50-fold reduction in the permissible dust layer for personnel objective and 25-fold reduction for the structural objective? These relations, 6.1.2.1 and 6.1.2.2, treat all particulates the same regardless of the bulk density, net heat of combustion or KSt. consequently, they produce results that are excessively conservative when used for the majority of the particulates that we encounter.

Now this facility is operated by a client of mine and it actually had a deflagration in the process equipment which vented into the facility interior. The whole event was caught on videotape. There was no propagation of a deflagration fueled by the dust accumulations. I realize that one event does not constitute a trend. But this client has had two similar events at a second facility of the same size and neither of those resulted in propagation. So this client has some faith in 654-2006 but is not convinced that the limits in 654-2010 are valid.
So let’s use 6.1.3 and 6.1.4. \( P_{\text{max}} = 6.6 \text{ bar}; C_w = 500g/m^3 \). It’s a long-term lease of a spec building in an industrial park so we will assume a wall strength of 40 PSF and a DLF of 1.5 (worst-case). According to equation 6.1.3 \( M_{\text{exp}} = 17,583/\eta D \) grams. But what value do we use for \( \eta D \)? At Interfibe (another paper recycler that had a serious explosion several years ago) there were dust accumulations of 4 to 8 inches before the event (from contractor photos) and less than 1 inch after the event (scene documentation). At my client’s locations the 3 events we have investigated left the area near the vented deflagration clean – no residual dust. So I guess I shouldn’t use the “default value” but assume a worst-case limit of 1.00 for \( \eta D \). For calculating the permissible dust layer for the structural objective that allows me 17.5 kg over the 1,858 m² area for a total of 9.46 grams per m². This is equivalent to .0046 inch thick layer if the layer is disturbed evenly over the entire interior. Even if I used the default value for \( \eta D = 0.25 \) we get a layer 4 times that thickness or 0.018 inches in thickness. This is far less than dust layer depths that did not produce a propagating deflagration in 3 out of 3 incidents. For the personnel safety objective, again setting \( \eta D = 1 \) I get 244.4 kg/\( \eta D \) of dust permitted over the 1,858 m² area for a total of 131.5 g/m². At 5 lb/ft³ this equates to 0.32 inch in depth, much closer to what I get using 654-2006. Yet this client has 3 events on videotape with dust depths greater than this number and there has been no evidence of deflagration extension into the building interior even though there appeared to be 100% dispersion. If I use \( \eta D = 0.25 \) I get a dust layer depth of 1.28 inches over the entire interior area. I cannot expect that much dust to not produce a propagating deflagration.

I understand that if the fugitive dust accumulations were limited to a fraction of the area of the facility that this computational method would allow for deeper dust layers in that fractional area. And that is a definite advantage, especially for the denser, more energetic dusts that pose a greater hazard and in process facilities where the fugitive dust layers occupy a fraction of the building. Less dense dusts tend to migrate further and a commensurately larger portion of the facility must be used in the area calculations. If I assume that the dust in the above example only occupies 25% of the total building floor area then the dust layer thickness becomes 5 inches, equal to what blew two employees out the end of the Interfibe building.

Something is wrong here. And there is NO ALTERNATIVE to using these relations in the proposed new standard.

In the current edition of the standard we have the simple measurement in 6.2.3.1 and if we don’t think the result is reasonable we can correct for bulk density and net heat of combustion and get a number that is more closely correlated to the actual dust in question. We have no loss history that I can find that suggests that the simple relation in NFPA 654-2006 is insufficiently conservative to allow for safe operations.

With the proposed new edition we have only one alternative, and that is to come up with a value for \( \eta D \) other than the default value. Minor problem – there is no test method for doing that! Until we have a method for quantifying how much dust is going to be dispersed, regardless of the mechanism, and the fraction of the dispersed material that actually participates in the combustion process we are stuck. Without this information we cannot even use Chapter 5 to develop a hazard determination criterion.

That is why there is so much opposition to these relations right now. When we plug in data for real-life situations they lead to conclusions that are unachievable or are not
supported by the loss history. Furthermore, the tools facility operators need to comply with the requirements that are laid-out in the proposed new standard don’t yet exist.

Before we can use this computational method we must have a method to quantify how much of an accumulated layer is dispersed, regardless of the actual mechanism. We must have a method to quantify how much of the dispersed dust actually burns. We must have a method to quantify the results of the combustion. Le Chatier’s principal tells us that when a chemical reaction does mechanical work it tends not to proceed to completion. Pressurizing a building and accelerating dust is mechanical work. Heating the dust up to AIT absorbs heat. In most of the event reconstructions I have done I find that the combustion process consumes the majority of the oxygen and becomes oxidant-limited. These factors all contribute to likelihood that the initial ignition will lead to a propagating deflagration.

We have not yet had the time to connect all of the dots. We have a partial computational model of what we expect to happen. Now we have to try to verify that model with event data to see if the model is a good predictor of the event. This hasn’t occurred. The initial “reality-checks” I have started with my event data suggests that there are unaddressed issues that we should address before we issue this document as the nationally recognized minimum-compliance standard of care.

The TC has used a 5% probability of flame impingement criterion in the personnel objective relations. As I remember Bob Zalosh’s presentation during the ROP meeting he used 5% as an example. Was it his intent that the TC simply embrace that number as the appropriate value? Is this number acceptable to the stakeholders at the site? Is it acceptable to the workman’s compensation insurance carrier, the owner and the employees? NFPA 654 should not stipulate what this acceptable loss level is – it should be left to the owner/operator and the other stakeholders in the site.

Finally, we need to keep in mind that this standard is not for us – we have been entrusted with writing it for the American public. It is supposed to be a hazard management tool that enforcement personnel, plant managers, facility engineers and consultants can used to manage the hazards encompassed by the scope statement. If we make the document too difficult to use we will make it irrelevant. OSHA is going to develop its own dust explosion hazard regulation which will permit the use of NFPA standards as a performance-equivalent alternative (I hope). We can make our document easy to use or hard to use. If it is easy to use then facility operators will use it and we have the ability to ensure that they are using methods that assure their employees and owners that the hazards are properly addressed. If we don’t, then the document that gets used will be written by some one else and we loose the leadership position. I don’t think there is a more competent, devoted group of people than our TC.

654-6

I moved adoption of comment # 654-33. When the TC decided to move the requirements for return air diversion to the section on air-material separators, a good idea, it managed to loose the requirement for return air diversion and, instead, required deflagration isolation. At Rochester Shoe Tree deflagration isolation was provided on the return air duct. When the dust collector caught fire, smoke, flame and burning filter media was conveyed back into the plant setting the plant on fire, burning 5 employees
and destroying the building. The deflagration isolation system, that is now **required** by the proposed new edition of 654 and manufactured by a firm that is represented on the TC, never operated. That’s because the deflagration isolation system relies upon pressure sensors for actuation. During a dust collector fire the needed pressure rise does not occur. Furthermore, even if it did actuate, the deflagration isolation system does not provide sufficient agent to offset the nominal 10-25 MW heat release rate of a dust collector fire. Indeed, the Listing of deflagration isolation systems does not contemplate the prevention of flame from vessel fires, only the transitory flow of deflagration flame front.

The only effective means of managing the fire hazard associated with the return of cleaned air from a dust collector is with return air diversion using abort gates. The overwhelming majority of the dust collector explosions we see start off as dust collector fires which transition to deflagration when the automatic bag cleaning feature operates. Only a fraction of the dust collector fires end up as explosions. Accepting Comment 654-33 would fix this error.

**654-8**

I moved that the membership accept proposal 654-7 and 654-10. These two proposals establish definitions for “deflagration hazard” and “explosion hazard” so the requirements in Chapter 7 would actually have an explicit definition to rely upon. These motions were tabled during the annual meeting pending the outcome of the vote on 654-9.

**654-9 submitted by Sam Francis, AF&PA**

I support this motion. There are numerous interdependencies and cross-references within this document. If selected motions to amend are accepted without returning the entire document to the technical committee there is a very real possibility that a disjointed, internally inconsistent document would result, precipitating the need for any number of Tentative Interim Amendments.

**4. Statement of Relief Requested.**

Return the entire 654 report back to committee. There are enough problems with the proposed document that a piece-meal repair is not practical and would likely lead to a document that is either internally inconsistent or incompletely addresses the fire and explosion hazard management issues.
Technical Committee on Handling and Conveying of Dusts, Vapors, and Gases,

Recommendation: Revise definitions for Dust Explosion Hazard Volume changed to Dust Explosion Hazard Area and Dust Deflagration hazard area changed to Dust Flash Fire Hazard Area and add a new definition for flash fire from NFPA 2113. Modify text in Chapter 6 and elsewhere throughout the document to reflect these changes in the terms.

3.3.3.16 Flash Fire. A flash fire requires an ignition source and a hydrocarbon or an atmosphere containing combustible, finely divided particles (e.g., coal dust or grain) having a concentration greater than the lower explosive limit of the chemical. Both hydrocarbon and dust flash fires generate temperatures from 1000°F to 1900°F (538°C to 1038°C). The intensity of a flash fire depends on the size of the gas, vapor, or dust cloud. When ignited, the flame front expands outward in the form of a fireball. The resulting effect of the fireball's energy with respect to radiant heat significantly enlarges the hazard areas around the point of ignition.

3.3.x Deflagration Hazard Area

3.3.x.1* Dust Explosion hazard volume area. A room or building volume where an unvented deflagration of the entrainable dust mass can result in a pressure exceeding the strength of the weakest structural element not intended to fail.

A.3.3.x.1 Dust Explosion Hazard Area. See NFPA 68, Standard on Explosion Protection by Deflagration Venting for evaluating strength of enclosures.

3.3.x.2 Dust Flash Fire hazard area. An area where combustible dust accumulation on exposed or concealed surfaces, outside of equipment or containers, can result in personnel injury from thermal dose during a dust deflagration, as well as any areas where dust clouds of a hazardous concentration exist during normal operation. A propagating deflagration yields a flash fire through the hazard area.

A.3.3.x.2 Dust Flash Fire Hazard Area. See NFPA 68, Standard on Explosion Protection by Deflagration Venting for evaluating strength of enclosures.

4.6.1.1 The facility, combustible particulate processes, and human element programs shall be designed, constructed, equipped, and maintained to protect occupants not in the immediate proximity of the ignition from the effects of fire, deflagration, and explosion for the time needed to evacuate, relocate, or take refuge.

6.1.1* Those portions of the process and facility where a dust explosion hazard or flash fire hazard exists shall be protected from the effects of these hazards in accordance with this section as well as Sections 6.2, 6.3, and 6.4 and Chapter 7.

6.1.2* Unless supported by calculations per 6.1.3 and 6.1.4, dust explosion hazard volume areas and dust flash fire hazard areas shall be deemed to exist when the total accumulated dust mass exceeds \( 1 \text{ kg/m}^2 \times \text{min} \times \text{footprint} \) or \( 100 \text{ m}^2 \times \text{thresholds calculated in 6.1.2.1 or 6.1.2.2, respectively.} \)

6.1.3* It shall be permitted to evaluate the threshold dust mass establishing a building or room as a dust explosion hazard volume area, \( m_{\text{exp}} \), per equation 6.1.3.

6.1.4* It shall be permitted to evaluate the threshold dust mass, \( m_{\text{fire}} \), establishing an area as a dust flash fire hazard area, per equation 6.1.4.

6.2.2 Use of Segregation.

6.2.2.1 Physical barriers that are erected to segregate dust flash fire hazard areas shall be a minimum 1 hour fire separation assembly, including seals at all penetrations of floors, walls, ceilings, or partitions.

6.2.2.2 Physical barriers that are erected to segregate dust explosion hazard volume areas shall be designed to preclude failure of those barriers during a dust explosion per NFPA 68, Standard on Explosion Protection by Deflagration Venting.

6.2.3 Use of Separation.

6.2.3.1* When separation is used to limit the dust flash fire hazard area, the required separation distance between the flash fire hazard area identified in 6.1 and surrounding exposures shall be determined by the following:

1. Engineering evaluation that addresses the properties of the materials
2. Type of operation
3. Amount of material likely to be present outside the process equipment
4. Building design
Flame front diverters can divert deflagration flames by directing them to the atmosphere. However, these devices do have limitations. If the air-moving device is located downstream of the flame front diverter, an explosion originating upstream of the diverter can propagate past it because of the deflagration flames being sucked into the downstream side, despite the open diverter cover. Also, tests suggest that some diverters could be ineffective in completely diverting a deflagration involving a hybrid mixture whose vapors exceed the LFL, regardless of the location of the air-moving device. Nevertheless, in both situations where a flame front diverter allows propagation, the deflagration severity in the system is expected to be reduced.

Wherever the exposure hazard has been referenced to a "volume", make the change to an "area." Wherever the consequence from the hazard results from thermal exposure it will be referred to as a "flash fire hazard" and wherever the consequence from the hazard results in an overpressure it will be referred to as an "explosion hazard." This direction applies to correct other Committee actions regardless of the terms used in those actions.
as a "flash fire hazard" and wherever the consequence from the hazard results in an overpressure it will be referred to as an "explosion hazard." The action in this comment also incorporates changes to the definition for combustible dust based on the action in Comment 654-4 (Log# 26). See also the action on Comment 654-44 (Log# CC12) regarding additional text for paragraph 6.2.3 and the action on Comment 654-45 (Log# 39) that has been incorporated into the revision of paragraph 6.4.1. This also incorporates the action from Comment 654-43 (Log#14).

**Committee Meeting Action:** Accept

**Number Eligible to Vote:** 29  
**Ballot Results:** Affirmative: 26  Negative: 2

**Ballot Not Returned:** 1  
**Floyd, L.**

**Explanations of Negative:**

**CHASTAIN, B.:** There was a vote during the Baltimore meetings and the vote substantiated using "deflagration" to fire hazard. On a subsequent teleconference with different participants the same person who wanted "flash fire" in the document as opposed to "deflagration" brought it up for a second vote. The vote passed as all the the original voters present in Baltimore were not present on the teleconference due to prior commitments. Not enough time was allowed in scheduling teleconferences after the Baltimore meeting for all attendees to make arrangements to attend as prior business commitments prevented them from participating in subsequent teleconferences. Furthermore, the term deflagration has been used now for over 5 years in NFPA 654, the user community has trained their people to recognize what a "deflagration hazard" is and now the user community will be required to retrain their employees to the new term, "Flash Fire" which does nothing to improve the document adds confusion and costs to the user community.

**CHOLIN, J.:** The need for this definition has not been clearly demonstrated. The term deflagration is used in all of the other NFPA document that deal with preventing dust explosions as well as the model building codes. The term "flash fire" suggests something that is transitory in nature and could lead readers to conclude that it is not a significant hazard to personnel. The fact that NFPA 2113 has defined this term should not serve as a basis for abandoning the term deflagration which has been used for the past 40 or so years and is widely understood. Furthermore, the notion of "damaging pressure" is relative and unenforceable. The pressure that damages a person is very different than the pressure that is sufficient to exceed the acceptable damage threshold for a building of piece of process equipment. There are numerous examples of cases where occupants have been thrown off of catwalks or down onto the floor by the pressure front of a deflagration which did not produce damage to the building - the people involved were damaged.

The language reflected in the ballot is NOT what the majority of the TC adopted during its 2 day meeting in Baltimore. During that meeting the TC adopted the use of the term "deflagration" rather than "dust fire" and "flash fire" because there was a 40-year history of using the term deflagration, the term "deflagration" is used in all of the other NFPA dust standards as well as the model building codes and the term connotes something that is very different from the "fire" that conventional fire protection assets are designed to address. Then the TC continued its meetings with a series of teleconferences that were scheduled on such short notice that only a fraction of the committee was free to participate. The ballot reflects decisions made by this small fraction. The practice of revisiting these definitions in the context of teleconferences scheduled such that only a fraction of the TC could participate deprived the full committee of the opportunity to participate in the discussions and the voice vote. This is NOT what is intended in the Rules Governing Committee Projects and erodes the integrity of the NFPA Codes and Standards writing process.
The current building codes do not establish when a building or room must be protected against a dust explosion. Nor do they set the allowable quantity of a hazardous (combustible) dust in a control area, above which automatic fire suppression is required. Similar to NFPA-30 for liquids, NFPA-654 should establish these limits for dusts. Also, similar to NFPA-30, NFPA-654 should establish an acceptable amount of material in process, in this case, escaped dust.

This proposal clarifies when a Dust Explosion hazard and a Dust Fire Hazard exist in an operation handling combustible dust. The current text mentions these situations but provides no quantitative method to determine how much dust or what distribution of dust results in the hazard. In addition, the current text does not clearly differentiate between dust accumulations requiring electrical classification or those presenting a dust explosion hazard.

This proposal does not set a maximum amount of dust accumulation in a facility. Instead, just as for other materials, it establishes additional protection requirements when a certain amount of accumulation is exceeded.

The criteria for a dust explosion hazard is based on the ability to produce overpressure sufficient to cause building structural failure in the absence of some explosion protection method, typically venting. This is based on the worst case dust concentration, meaning that concentration and its associated maximum deflagration pressure, \( P_{\text{max}} \), which give the largest building fill fraction. The worst case fill fraction would come from NFPA-68, section 8.3.4.

The criteria for a dust fire hazard area is based on local fugitive dust accumulation exceeding a mass of 1 kg/m\(^2\) on a single square meter of surface between routine scheduled cleaning. This amount of dust, if dispersed, could create an explosible dust cloud of 2 to 4 meters height in a local area. Such a cloud would present a potential for a flash fire with personnel injury as well as ignition of other combustibles. Engineered dust collection and a sufficient routine housekeeping schedule can minimize dust fire hazard areas. When fugitive equipment leaks, then a local accumulation exceeding the 1 kg/m\(^2\) criteria between scheduled general cleaning would be cleaned up in shorter times as the local accumulation rate increases.

A small dust fire hazard area would require manual fire protection. If the process results in more than 5% of the fire-separated area (room or floor) exceeding the criteria between routine cleaning, effectively a minimum average of 0.05 kg/m2 or 10%-20% of the MEC, the entire area would be protected with automatic fire suppression. This includes all the areas which experience short term accumulations beyond 1 kg/m2 in a typical 24 hour operation, the longest allowed local cleaning period.

The need for electrically classified equipment for ignition prevention is clearly separated from the explosion and fire hazards. The dust layer thickness, that is accumulation, used to determine electrical classification, is different than those for provision of automatic fire suppression or explosion protection.

Committee Meeting Action: Accept
Number Eligible to Vote: 28
Ballot Results: Affirmative: 20 Negative: 3
Ballot Not Returned: Barton, J., Gillis, J., Hunter, R., Hurst, G., Ness, A.

Explanation of Negative:

CHOLIN, J.: The proposal introduces the term "dust fire" which is not defined nor is it distinguished from the term "deflagration" that has been used for decades in this and numerous other NFPA documents. The submitter has not substantiated the need or advisability for introducing this new term.

The committee proposal is too complex to be routinely enforced by non-engineers for determining if a has are exists or not. The proposed material should be included in an annex to Chapter 5 as a manual of practice.

The committee proposal calculations rely on the concentration producing the maximum pressure, not the minimum concentration that propagates a deflagration flame front, MEC. This leads to under-assessment of the hazard.

SUTTON, J.: While I agree with the concept of establishing hazard areas based on the amounts of dust, I do not agree with using an entrainment factor of 0.25 in these equations as this would result in an increase in the amount of dust allowed in an area and there is not an adequate technical basis for using a 0.25 entrainment factor.

URAL, E.: Change \( \text{eta}_{\text{D}} \) value to 1.0 for elevated deposits, and 0.25 for ordinary floor deposits
Comment on Affirmative:
BEATTIE, W.: The .25 factor is not substantiated. This may permit higher than acceptable levels of dust. If any factors
less than 1 is used, the use of the factor should be substantiated by tests.
Add the following new definitions:

3.3.x Dust explosion hazard volumes: those room or building volumes where an unvented deflagration of the entrainable dust mass can result in a reduced pressure, $P_{red}$, exceeding the ultimate dynamic strength of the weakest structural element not intended to fail.

3.3.x Dust fire hazard areas: those areas where combustible dust accumulation on exposed or concealed surfaces, outside of equipment or containers, can result in personnel injury from thermal dose during a dust deflagration, as well as areas where dust clouds of a hazardous concentration exist during normal operation.

Replace existing 6.1 with the following and renumber as needed:

6.1 General. The provisions of this section shall apply to the overall design of systems that handle combustible dusts.

6.1.1* Those portions of the process and facility where a dust explosion hazard or fire hazard exists shall be protected from the effects of these hazards in accordance with this section as well as Sections 6.2, 6.3, and 6.4 and Chapter 7.

6.1.2* Unless supported by calculations per 6.1.3 and 6.1.4, respectively, dust explosion hazard volumes and dust fire hazard areas shall be deemed to exist when total accumulated dust mass exceeds 1 kg/m² multiplied by 5% of the building or room footprint.

A.6.1.2 This is equivalent to 0.8 mm ($1/32$ in.) based upon a settled bulk density of 1200 kg/m³ (75 lb/ft³). The following equation provides a means to estimate an equivalent depth from a known value of settled bulk density.

6.1.2.1 All dust accumulated on structures above the lowest footprint shall be evaluated as if accumulated on the lowest footprint.

6.1.2.2 The maximum footprint to be used to calculate the total dust mass shall not exceed 2000 m².

6.1.3 It shall be permitted to evaluate the threshold dust mass establishing a building or room as a dust explosion hazard volume, $m_i$, per equation 6.1.3.

where
M_{\text{exp}} \text{ is the threshold dust mass (g) based upon building damage criterion,}
\quad c_w \text{ is the worst case dust concentration (g/m}^3\text{) at which the maximum rate-of-pressure-rise results in tests conducted per ASTM E1226,}
\quad P_{\text{red}} \text{ is the allowable pressure (bar g) developed during a deflagration per NFPA 68,}
\quad P_{\text{max}} \text{ is the maximum pressure (bar g) developed in ASTM E1226 tests with the accumulated dust sample,}
\quad A_{\text{floor}} \text{ is the enclosure floor area (m}^2\text{),}
\quad \eta_D \text{ is the entrainment fraction}
\quad \text{and } H \text{ is the enclosure ceiling height (m).}

6.1.4 It shall be permitted to evaluate the threshold dust mass establishing an area as a dust fire hazard area, per equation 6.1.4

****Insert Equation E654-22 Here****

\text{Eqn 6.1.4}

Where, M_{\text{fire}} \text{ is the threshold dust mass (g) based upon personnel fire exposure criterion.}

6.1.5* It shall be permitted to assume a default value of 0.25 for the entrainment fraction (\eta_D).

A.6.1.5 A higher value for \eta_D is more appropriate for ducts and small enclosures less than 100 m^3 and for enclosures with L/D ratios greater than 5, such as galleries. Research activities are currently in progress to define a technical basis for estimating \eta_D.

6.1.6 It shall be permitted to use a lower value of \eta_D based on a risk evaluation that is acceptable to the authority having jurisdiction.

6.1.7 Dust accumulation amounts shall reflect the conditions resulting from routinely scheduled cleaning, and not include short term accumulations cleaned in accordance with Chapter 8.
Equation A.6.1.2

\[
\text{Equivalent Depth (mm)} = \frac{1000 \cdot \text{Accumulation (kg/m}^2\text{)}}{\text{BulkDensity (kg/m}^3\text{)}}
\]

Equation 6.1.3

\[
\text{Equivalent Depth (mm)} = \frac{1000 \cdot \text{Accumulation (kg/m}^2\text{)}}{\text{BulkDensity (kg/m}^3\text{)}}
\]

Equation 6.1.4

\[
M_{\text{fire}} = 0.05 \left[ \frac{C_w}{1 + P_{\text{max}}} \right] \frac{A_{\text{Floor}}}{\eta_D} \delta
\]
1 motion on the floor which is to accept Comment 654-5.
2 All in favor of the motion, please signify by raising
3 your hands.
4                                    (Raising Hands.)
5          SHANE CLARY:  Thank you.
6          All opposed?
7                                    (Raising Hands.)
8          SHANE CLARY:  The motion carries.
9          The next motion appeared on our agenda;
10 however, the authorized maker of the motion
11 (indiscernible) representative has notified NFPA that
12 they no longer wish to present this motion. Therefore,
13 in accordance with NFPA rules and convention rules 2.6,
14 the motion may not be considered by the assembly and
15 removed from the agenda.
16                                    We will now move to the next agenda item which
17 is 654-3.  654-3.
18          And Microphone No. 1.
19          JOHN CHOLIN:  Mr. Chairman, John Cholin from JM
20 Cholin Consultants, independent consultant speaking --
21 representing myself, a member of the committee, and I am
22 moving acceptance of the motion to return the
23 identifiable part identified as Section 6.1 to the
24 committee for reconsideration.
25          The proposed new section 6.1 --
SHANE CLARY: Do we have a second?

(Second.)

SHANE CLARY: Thank you.

Mr. Cholin, you may now proceed.

JOHN CHOLIN: Thank you.

The proposed new section, 6.1, provides a performance based method for achieving the objectives stated in the standard. However, it relies upon assumptions that on some cases are not proven or in other cases are only partially true.

Consequently, while there's enormous intellectual value in this material and certainly we would not want to lose it, it is not yet ready for inclusion into the document at this time.

It is not technically wrong, but it is incomplete, and it's incomplete in four areas. This new section fails to establish criteria for the determination that an enclosure poses an explosion hazard. As it is needed, if one is to comply with the rest of the standard, the proposed new language addresses only building compartments, not any other enclosure.

The proposed -- secondly, the proposed new section eliminates an existing easily enforceable criterion and replaces it with a set of equations which
must be used to determine if the maximum permissible
dust mass exists in a hazard area.

Unfortunately, this method is sufficiently
difficult to actually perform that most enforcement
officials and plant managers will not use it. This will
force enforcers and users to seek some other methodology
to use some other standard undermining our reliance on
NFPA standards.

Third, to properly use the proposed method, the
user must perform calculations that rely upon a
numerical value for an entrainment factor ADA (phonetic)
sub D. No test method exists to quantify or to predict
the numerical value of this parameter forcing the user
to either guess or to hope that the permitted default
value is correct.

The calculations to be used to compute the dust
loading that pose a flame impingement hazard to the
employees assumes that a 5 percent of flame impingement
is acceptable.

The technical committee has a questionable
basis for this assumption. I question whether this
assumption adequately was vetted by the public when the
public reviewed the proposed actions. Let's look at the
big picture.

The current edition of the standard provides a
simple, measurable dust layer of thickness that is used to establish where an explosion hazard exists. The language is admittedly not the best language, but the existing standard provides for an easy method to identify when you have an explosion hazard and when it does not.

The existing standard provides for the adjustment for both particles that have both densities lower than 75 pounds per cubic foot used to rationalize 32nd of an inch criterion. Chapter 5 of the existing document allows one to use a performance based design method just like the equations that have been proposed if a designer seeks to do so.

Keep in mind that over the 30 years that I've been dealing with combustible dust investigating incidents, I've never performed an investigation where the dust deflagration occurred in a facility that complied with the current additional NFPA 654, and every incident that we've investigated, it could have been prevented by merely complying with our current document. We have time to do this right. There's no need to rush. So while there's considerable intellectual merit in the proposals --

SHANE CLARY: One minute.

JOHN CHOLIN: I understand.
they do not belong in the mandatory section of the standard at this time. The lack of relevant research, test methods, and consensus on acceptable levels of risk militate returning this to the committee. Thank you.

SHANE CLARY: Thank you.

Mr. Frank, would you like to offer the committee's position?

WALTER FRANK: Okay. On behalf of the committee, I speak against the motion. Again, this was an issue that the committee voted very predominantly in favor of the proposed revision to the standard.

By way of background, let me just point out that what we sought to do in the current revision was to provide more clear-cut guidance on identifying those areas where dust flash fire hazard existed and those areas where dust explosion hazards existed so that the appropriate protection, the protection's appropriate to the particular hazards could be applied.

You're going to see a number of motions today that talk about basically deleting or removing the new section, 6.1, of the proposed standard. This is the standard that has the equations that Mr. Cholin was referring to.

Those equations were what we provided to
identify -- to help identify the flash fire hazard areas versus the dust explosion hazard areas based on the mass of dust necessary to pose either the flash fire -- dust flash fire hazard or the dust explosion hazard.

Removing or backing out the current -- or the proposed Section 6.1 will send us back to the existing criteria that's in the standard. You will hear that criteria referred to as being suitable to address the sorts of concerns that the committee seeks to address.

In fact, if you read the current -- the 2006 edition -- decision of 654, the existing criteria are only intended to be applied when separation is used to limit the fire or dust explosion hazard area, and we tried to protect surrounding exposures by separation, by segregation, by detachment.

The existing criteria that Mr. Cholin wants to take us back to, according to the explicit wording in the standard, only apply to separation to determining the required separations distance between a dusty area and the surrounding exposures. It does not provide the sort of criteria that we need to identify dust -- flash fire hazards and dust explosion hazards.

There was reference to the fact that the current equations do not address -- do not identify whether there are hazards inside enclosures, neither
The existing criteria that Mr. Cholin wants to take us back to. The existing criteria that he wants us to go back only identifies room hazards and point of fact so do our equations. There's no issue there. Both of them -- either of those approaches address issues with -- as far as explosion concerns inside public (indiscernible).

There's reference to concern that the flash fire criteria, the flash fire equations will potentially expose up to 5 percent of the people in a room or due to a flash fire hazard or put it another way, the flash fire resulting from the threshold mass determined by the equations will fill about 5 percent of the room with a fireball.

The existing criteria that Mr. Cholin wants to take us back to will fill the room -- 50 percent of the room with a flash fire. The existing criteria will -- depending on the assumption you want to make about the amount of venting in a room, potentially create 20, 30 PSI pressure -- explosion pressure in a confined room.

Bottom line, the existing criteria in the 2006 edition of 654, the number of motions today will seek to take us back to are not sufficiently protective, and the committee recognizes this and that is the reason why we have the new equations.

There was a mention that the equations are too
hard to use. There's actually two sets of equations.
Some simple equations that assume some conservative
default values. Some more rigorous equations that --
where you can impute dust specific and building specific
data to get a more rigorous approach. The simple
equations are -- give you understandable results.

If you can calculate the square foot of surface
area of a floor of a room, you can use both of the
simplified equations. That's all the technical
sophistication you need to use the simpler equations.

You have to be able to calculate the square footage of
the floor area in a room.

Admittedly, the other equations are more
detailed. They would only be used where -- again, where
the simple equation gave results that the user could not
live with and needed to go to a more detailed analysis.

The final point is that yes, we do require the
use of an entrainment coefficient. This is basically
the percentage of the dust that's assumed to be
suspended from the floor or from the ceiling in the
event of an event. The standard proposes an interim
basis a default value of .25, 25 percent of the dust
suspended.

Historical records indicate that it could be
smaller, it could be larger, but the concept of
entrainment factor is inherent with the existing 132nd
of an inch criteria, the criteria that people want to
take us back to, and Appendix D addresses the fact that,
yes, varying amounts of dust will be suspended.
I will say that there is a research project
going on to provide a more technical approach to
estimating what the entrainment co-efficient might be,
but looking at history, using --
SHANE CLARY: I think you've reached your
conclusion here, please.
WALTER FRANK: I'm sorry. Okay.
SHANE CLARY: Thank you. And with that, we'll
begin with debate on the motion. It looks like
Microphone No. 2.
ERDOM URAL: Oh, that's me.
SHANE CLARY: That is you.
ERDOM URAL: Thank you. Good afternoon again.
My name is Erdom Ural. I'm voting for myself, and I
will be talking to support the committee decision which
is, I guess, to -- against the NITMAM.
I appreciate that the submitter has
acknowledged the value of the new equations and, in
fact, the new equations are just based on simple thermal
dynamics and back-of-the-envelope-type calculations, so
nobody's disputing whether there's an error in the
equations or not.

There are a couple of issues that are being brought up. One is there is one adjustable parameter in the equation, mostly appropriate value for that. The other one is measuring the dust thickness versus dust mass, and I also heard something about not being vetted by the public, but let me try to address them one by one.

Measuring a 132nd of an inch thick layer on a surface, I don't know if anybody has tried to do that, but boy, is it hard. You really can't put the ruler in there and try to measure what thickness is a 132nd of an inch. It's a tiny thickness.

So when I do inspection on the plants, I don't try to measure the thickness. I just try to either sweep up a lone area and/or I suck up through filter paper dust accumulated in a certain area so that I can actually measure the weight.

Then with the current addition, I need a thickness so I will convert to a thickness using above density. But the problem there is that with the above density is parameter with another uncertainty. The bulk density of the layer -- the bulk density of the material in the containers under hydrostatic or the static load are known under compression. The bulk density of the
layer nobody knows.

The second issue, it's not vetted by the public. That's not true. The equations have been in the ROPs, they have also been on the ROCs. The equations have been presented to the American Society of
Chemical Engineers at the Loss Prevention Symposium in 2009 to public and NFPA Dust Symposium in 2009 and finally this year at the loss prevention symposium at the -- for American Chemical -- American Institute of Chemical Engineers, and people liked it so much, in fact, they gave our best paper award.

Third item: We have a performance based approach, why not do it -- why not use that instead of the equations. The problem with the performance base approach is that the people have to hire an expert to do it for them 'cause not many people can do it. And I know Mr. Cholin does it and I do it and maybe Mr. Frank does it.

The problem with that is different experts do it different way where they come up with different answers, but the committee that's here, that's the value -- true value here is that we got together, we said what's the common denominator? What's the simple thing -- simple performance base thing we can do that will be a used by anybody?
So people can take these equations, and believe me, they are not difficult equations. Just algebraic form. You just take the parameters and you just multiply or you divide them. There is no iteration or anything required. So this way there is a simplified performance that's been blessed by the committee already so it's truly --

SHANE CLARY: One minute.

ERDOM URAL: -- valuable. Well, I'll stop here. Thank you.

SHANE CLARY: Okay. Thank you.

Microphone No. 5, please.

SAM FRANCIS: Sam Francis, American Wood Council, and I'm the proponent of one of the motions that was lumped together which John has moved forward. I'm speaking in support of this motion.

In theory, there's no difference between the theoretical and the practical, in practice there is, and this is the living, breathing example of that. First -- this is really -- three simple points: First, Chapter 5 already let's you do this performance based approach and the algebra of the equations is simple, but each of those elements, take a look at them. Turn to the comment and look at those things.

For example, the determining and training
factor, look at it. It's not simple, but you can use it right now. Go to Chapter 5. What you're doing is getting rid of the tool that enforcers have used, so fire marshals, fire service. This is for you.

Now you're going to have to go in and do what the opponent just described -- shut the place down, vacuum up some samples, take a weighted average of surface area, bulk density. Hey, they're going to love you for that because you just stopped the whole thing. So enforcers are going to be pulling their hair out.

This is a nightmare.

But more importantly, and I have several more of these motions coming up because this is the heart and sole of this whole thing. Determining risk is what it's all about. You don't even get to the rest of the standard if you don't have a risk. The whole -- the problem here is there's not a shred of evidence ever brought forth in conjunction with this that says the existing standard and its measurement systems risk determination has caused a problem.

We're looking -- now we have a solution in search of a problem. Not a shred of data. There's not one. It's not been submitted. Look back at the proposal, look back at the comment. It has to do with the theory of the risk assessment and the differences
between measuring settled bulk density of dust and calculating these in another manner.

But if doing the simple measurement that I might add the inspector coming in off the street can do, where are we going with this? Moreover, where we're going, the performance base, is already permitted. So supporting the motion gets you the simple time tested and proven system and does not in any way disqualify doing a performance based assessment.

SHANE CLARY: Thank you.

Microphone No. 2.

BILL STEPHENSON: Thank you. Am I on?

SHANE CLARY: You're on.

BILL STEPHENSON: My name is Bill Stephenson, CB Technology, member of the committee. I think it's important that we all --

SHANE CLARY: Are you speaking against or in favor.

BILL STEPHENSON: I am speaking against the motion.

SHANE CLARY: Thank you.

BILL STEPHENSON: Thank you.

I think it's important that we all take a deep breath and ask ourselves a couple of questions. One question is: Are the equations in the proposed document
vetted, and the answer is really they are because
they're based on the 68 equations.

They're consistent with a NFPA 68 2007 which is
based on NFPA 68 2002, which started with FM Global's
dust calc, work that was done by Dr. Taminini (phonetic)
over 15 years ago.

Secondly, we are being confronted with we have
a system that works that's easy to do a measurement of
32nd of an inch, but as Erdom has correctly pointed out,
it really isn't easy at all. And why do we have to shut
the whole plant down to square out -- square meter of
area and lift the dust, sweep the dust, weigh the dust,
come up with a mass density? I don't understand that.

Third, there's been a lot of discussion about
the entrainment factor. The entrainment factor that we
have used as a default value is actually nothing more
than a 32nd of an inch of dust with a 75-pound per cubic
foot mass density.

In other words, it's based on the existing 2006
document. So I think there's a lot of confusion about a
model that's really much more sophisticated and not
particularly difficult to employ. Thank you.

SHANE CLARY: Thank you.

Microphone No. 5.

DAVE SNELL: Yes. My name is Dave Snell. I'm
here representing the Edison Electric Institute and I'm speaking in favor of the motion.

The Edison Electric Institute is the association of U.S. share owned electric companies. Our members serve 95 percent of the alternate customers and the shareholder owns a segment of the industry and represents approximately 70 percent of the U.S. electric power industry.

We also have more than 70 international electric company affiliate members and more than 200 industry suppliers, (indiscernible) organizations, and associate members. For the reasons that we've already heard from Mr. Cholin, we support this motion. Thank you.

SHANE CLARY: Okay. Thank you.

WALTER FRANK: Mr. Chairman.

SHANE CLARY: Mr. Frank.

WALTER FRANK: I'm conscious that there are three -- underlying there are three motions and as each of the original movers speak I'd like to respond to some of their concerns.

There seems to be a fear of vacuuming. Most the facilities I've been in need vacuuming. They have unsafe amounts of dust. If you have enough dust to vacuum, you have too much dust so, you know, the concern
about oh, gee, we might have to vacuum is, I think to me, misguided. You should be vacuuming.

We're trying to provide some guidance to help you understand how frequently you need to be vacuuming. The proposal is -- this approach of defining a mass of dust that causes a concern, either a flash fire or an explosion concern, actually stems from an OSHA citation agreement.

A major paper company was cited for housekeeping concerns. They worked with OSHA as part of the settlement agreement. They gave an approach of using a mass threshold to trigger when housekeeping was required. It was integral to that settlement agreement. That paper company is now applying that same approach internationally throughout all of their facilities. It works.

As far as the 132nd of an inch criteria, indications are coming out of the OSHA dust NFPA that OSHA is applying that criteria rather simplistically. If they come into a facility, if they see a few square feet of dust 132nd of an inch thick, they issue a citation.

Not all inspectors understand how that criteria was meant to be applied, so I actually look at the equation as a way of a well-intentioned facility
operator to, one, keep the facility as clean as necessary and, two, to have a substantial response to OSHA if OSHA comes in and tries to cite them and I'll stop there.

SHANE CLARY:  Okay. Thank you.

Microphone No. 5, please.

BRICE CHASTAIN:  Hello. I am Brice Chastain with Georgia Pacific Corporation. I'm in support of John Cholin's motion and Georgia Pacific is as well.

I would like to address four areas associated with the four new mass equations. Number -- the first thing, lack of validation and substantiation; the second being lost history; the third being practicality or non-practicality of using these new methods.

While Georgia Pacific has reason to believe that the four theoretical equations make a promise in the future, there's no data for field trials of the proposed methodology of evaluation of lost history data comparing the old and new methods to show risk reduction benefits commensurate with the greater complexity and cost of the new methods.

These methods have not been studied in sufficient detail, substantiated or validated from a statistical standpoint to show they are any better at risk reduction than the current dust thickness method.
The complex theoretical methodology has not been refined based on actual trial use in several different industries to ensure it is understandable by the manufacturing plant populations that would have to use it or the regulators.

Dust layer thickness supported by (indiscernible) is more intuitive, an understandable method that could be more easily implemented to get the broadest risk reduction benefits both by industry and regulators. Accordingly, there is no demonstrated basis for adopting these theoretical equations at this time.

If the technical supporting data thought to justify these equations is later developed, another round of public comment would then be necessary to give interested parties sufficient time to consider the validity of the assertion that the data is adequate to validate the equations.

Even if the equations are scientifically validated in the future, there's no lost history at present that substantiates the need for new theoretical more conservative equations.

No loss history data has been presented within the 654 committee or anywhere else that implies that the previous dust thickness equations contained in the 2006 edition is not appropriate and has not served industry
1 in reducing the risk of combustible dust deflagration and explosions.

I also agree completely with the comments made by Mr. Cholin regarding the problems with the entrainment factor, and I will not discuss that. I will discuss the two simple equations. I mean, the algebra is simple. Let's face it, everyone can multiply .02 times the floor area. But the problem is it treats all dust equally.

A dust with a KST of 299 or a dust of 20 will have the same mass threshold using these simple dust equations. The risk is completely different for a KST of 299 and one of 20. Therefore, the simple conservative equations are too simple and they're too conservative.

Talking about the complex equations, and they are complex. I've been looking at these now for a year. In addition to two complex theoretical equations in the proposed Section 6.3, 614 which address explosion and fire protection are too complex for most general industry employers and the numerous facilities that do not have intellectual infrastructure in place. That means they don't have (indiscernible) engineer personnel present or available.

Many industry facilities will be substantially
burdened by the costs and the need to hire outside consultants to obtain this data, obtain laboratory test date --

SHANE CLARY: One minute, please.

BRICE CHASTAIN: -- apply the equations, and establish the structured (indiscernible) dust thresholds. From the past council perspective, you would be required to determine your mass threshold by using these equations, compare it to the mass in your buildings. How do you do this?

You look to be accurate about it. You would have to stop production, vacuum all the dust in the building, compare it to what your allowance is, and then determine your mass (indiscernible) frequency based on that. Who can do that?

Estimating a small area of the floor with all the different areas in the building that have nooks and crannies, hills and valleys with the dust layers would be impossible. From the regulatory perspective, these mass determination of verification (indiscernible) are also impractical for either the fire marshals, fire inspector, for OSHA to determine compliance or noncompliance.

Based on the fact that there's no loss history of minimal cost incurred by industry to implement the
1 2006 edition (indiscernible) equation acceptable
2 thresholds, we believe that the dust thickness
3 (indiscernible) equation can be used by all industries
4 to establish accumulation allowances without
5 unacceptable risks, uncertainties, impracticalities, and
6 excessive costs. The bottom line is these equations are
7 not ready for prime time.
8          SHANE CLARY: Okay. Thank you.
9          Microphone No. 7.
10          TIM CROUSHORE: Hello. My name is Tim
11 Croushore. I work for Allegheny Power, also
12 representative of the Edison Electric Institute. I've
13 been listening to several of the technical committee
14 argue for and against the technical merit of these
15 equations, but what really concerns me the most is what
16 the chairman said --
17          SHANE CLARY: Are you for or against the
18 motion.
19          TIM CROUSHORE: I'm speaking in favor of the
20 motion.
21          SHANE CLARY: Thank you.
22          TIM CROUSHORE: What really bothered me the
23 most was the entrainment factor in listening to the
24 testimony on the floor is the highest variable, we'll
25 call it crunch factor, of the whole equation. And when
That have been described as being so distressing are up or down based on bulk density, the same limitations other than the fact you can adjust that 132nd of an inch statement applies to the 132nd of an inch criteria. Equation in that they treat all dust alike. That same statement that the -- it is a fatal flaw with the simple.

WALTER FRANK: Yes, I want to address the.

SHANE CLARY: Thank you.

WALTER FRANK: And, Mr. Frank.

SHANE CLARY: Thank you.

WALTER FRANK: to go back to the 132nd of an inch method. Thank you.

SHANE CLARY: for the motion on the floor to return back to committee.

SHANE CLARY: based on the general areas, I would stand.

25 percent.

Currently, there's no guidance that exists in the

24 that would be because was going to be done that would impact the amount of --

23 chairman said that there was additional research that

22 further, listening also to the chairman, the

21 that equation is the -- it is a fatal flaw with the simple.

19 there's no guidance that exists in the

18 that 132nd of an inch criterion.

17 and, Mr. Frank.

16 thank you.

15 to go back to the 132nd of an inch method. Thank you.

14 for the motion on the floor to return back to committee.

13 so based on the general areas, I would stand.

12 25 percent.

11 currently, there's no guidance that exists in the

10 or what the entrainment factor would be because

9 chairman said that there was additional research that

8 further, listening also to the chairman, the

7 that is currently method that is currently

6 available.

5 instead of going to a more complex equation, why not

4 with a more simplistic method that is currently

3 on the current 132nd of an inch dust thickness, so

2 we listened a little bit more we found that it was based

1 we listened a little bit more we found that it was based
But we put those in the simple equations to give people the option of having that simple approach. We do have the more sophisticated equations for people that actually have data to discriminate between the different types of dust. But to make that discrimination, you would need the equations that are in the proposed revision 654.

As far as the comment about hills and valleys and nooks and crannies and trying to determine mass, I will tell you those same problems apply when you're trying to determine the depth of dust in the hills and valleys and nooks and crannies.

Returning to the 132nd of an inch is not the solution to the world's problems, and as I said earlier, the 132nd of an inch we have shown by calculation is not sufficiently protective unless you want to run the risk of filling 50 percent of your room with a dust fireball.

The technical inadequacy of the equation is the fact they're not substantiated. Again, the explosion equation is based on the underlying technology that supports NFPA 68 right now. If that technology is immature, then we need to be steadily in NFPA 68. That's the explosion calculation.

As far as the fireball calculation, it is based upon the ideal gas law and the laws of thermal dynamics,
and I think by now those have been pretty well substantiated by peer review. Thank you.

SHANE CLARY: Thank you.

Microphone No. 5, please. Number 5, please.

Ma'am, that's you.

MARY JO PRESS: Thank you. I'm Mary Jo Press from Canmen (phonetic) for industry, a manufacturer of combustible dust. I'm speaking in favor of this motion.

SHANE CLARY: Please proceed.

MARY JO PRESS: I want to address a couple of things that Mr. Rollins brought up. He's proposing that we add some things to Section 6.1 that's currently part of appendix. In his presentation yesterday, he readily admit a couple of things that really scared me as a manufacturer.

If I put PPE flash protection on my employees, then theoretically if I made my building strong enough, then I could have an unlimited amount of dust. That is taken us away from protection instead of putting the "P" back in NFPA.

I ask you not to give my plant managers an out choosing the cheap option of putting PPE on my employees instead of doing the right thing to eliminate the hazard. I ask that you vote with me to send this motion back to committee and put the right things back to
1 protect our employees. Thank you.
2           SHANE CLARY: Thank you.
3           Microphone No. 2.
4           ERDOM URAL: Thank you. I'll start with --
5           there was couple of --
6           SHANE CLARY: You need to start with your name
7           and for or against the motion.
8           ERDOM URAL: I'm sorry. I didn't want to bore
9           with those -- bore you with those details.
10          SHANE CLARY: For the record.
11          ERDOM URAL: I'm voting for myself voting
12 against the motion.
13          SHANE CLARY: Okay. Once again, though, what
14           is your name.
15          ERDOM URAL: Oh, Erdom Ural.
16          SHANE CLARY: Thank you.
17          ERDOM URAL: There was a couple of corrections
18 in the statements made by Mr. Francis and Mr. Chastain.
19 First, Mr. Francis said you need to settle bulk density.
20 With the ROC equations, you do not need the bulk
21 density. You need the bulk density only to convert it
22 to the layer of thickness. So if you are measuring
23 layer of thickness, you need the bulk density.
24 Similarly with the 2006 edition, if you are
25 measuring mass like I do most of the inspections, you
can convert it to layer thickness. With the 2006 edition, you need bulk density.

The other comment was the -- these new equations have not been -- there is some uncertainty about these equations and then let's go back to 132nd of an inch. The thing is, as I've stated earlier, the equations in themselves are sound.

In fact, NFPA 654 did assign the task force. It was me and Mr. Febo from FM Global, and we used the -- I used the new equations, he used his FM dust cap, and mind you this was only for the explosion equation. We got comparable results because the underlying science is the same. So the -- there was one adjustable parameter and that was selected to match the 132nd of an inch for the mainstream type of applications.

So if you have a main stream type of an application, you -- the new equations also give you results comparable to 132nd of an inch. But the committee was really alarmed when we started talking about these equations because these equations are screen out situations where the 132nd of an inch is unreasonably dangerous.

So that's why we like this, because it gives you the mainstream applications, a level comparable to
that 24 percent entrainment fraction, gives you
protection comparable to the 132nd of an inch which is
the existing accepted risk.

And it also tells you -- you can't have any
dust in certain applications. In other applications,
like tissue dust, you may be able to tolerate more.
There was couple other, but I forgot.

SHANE CLARY: Okay. Thank you.

Microphone No. 5.

MARCELO HIRSCHLER: Marcelo Hirschler GBH

International, I speak for myself, and I call the
question.

SHANE CLARY: We have a second.

(Second.)

SHANE CLARY: Numerous seconds.

All in favor of the motion which is
non-debatable to close discussion, please signify by
raising your hands. You know the drill. Thank you very
much.

(Raising Hands.)

SHANE CLARY: All opposed? Motion carried.

We will now proceed with the vote which is
returning a portion of the report in the form of
identifiable part of proposal 654-15 related comments,
654-10 (indiscernible) return is a new proposed section,
6.1. All in favor of the motion, please signify by raising hands.

(Raising Hands.)

SHANE CLARY: Thank you.

All opposed?

(Raising Hands.)

SHANE CLARY: The motion carries.

We now move to 654-4. I'll wait for Mr. Francis.

SAM FRANCIS: Sam Francis, American Wood Council, representing --

SHANE CLARY: Wait a minute. Microphone No. 5, please.

SAM FRANCIS: Thank you. Sam Francis, American Wood Council, representing Stan Lancey of the American Forest and Paper Association. Well, frankly in light of what just happened, I move to accept Comment 654 which is going to further address these equations but sending it back -- but let me just cut to the chase.

SHANE CLARY: Okay. Mr. Francis, 654 which --

what...

SAM FRANCIS: I don't care what you do with this. You resolve the equation problems and I'm going to move on my final comments to send the entire document back because you just cut out the heart.
Appeal of Actions Taken at the June 9, 2010 NFPA Technical Meeting
Regarding NFPA 654

June 29, 2010

Filed by:

Walter Frank, P.E.
Frank Risk Solutions, Inc.
1110 Shallcross Ave
Wilmington, DE 19806
302-521-7588

Action being appealed:

I am appealing the action taken at the 6/9/10 NFPA Technical Meeting, which passed motion 654-3.

Grounds for the appeal:

I am the chair of the Technical Committee on Handling and Conveying of Dusts, Vapors, and Gases, the TC responsible for NFPA 654.

While I am filing this appeal on my own behalf, I do so out of respect for the dedicated effort devoted by over 25 industry experts as they labored for the last two years to update NFPA 654. It should be noted that the TC voted in overwhelming support of the revised standard draft presented at the June 9, 2010 Technical Meeting.

I am appealing the decision to pass motion 654-3. I do so because I believe the vote taken at the Technical meeting did not adequately consider the technical merits of the issues underlying the motion and the changes that it sought to prevent being made to NFPA 654. I further believe that the standard presented on behalf of the TC provides significant advances in the control of combustible dust hazards and that industry would be disadvantaged by delays in issuing the revised version of NFPA 654.

As technical substantiation, I am attaching the statement that I filed today with my ballot on the NFPA 654 Amendment to Return Entire Report. Of particular relevance are points 2) to through 9) detailed in the document. I also cite my rebuttal of the motion, as documented on pages 61 through 88 of the transcripts of the June 9, 2010 meeting.

In summary, the Motioner sought to prevent adoption of section 6.1 of the draft standard. This section seeks to provide an improved basis for the identification of hazard zones within process facilities handling combustible dusts – zones where the
quantities of dust present in the work environment pose untenable hazards due to the potential for dust flash fires and dust explosions.

The TC worked two years to address some very difficult technical issues that served as the basis for the proposed section 6.1. The value of this effort was negated in about 30 minutes based upon unsupported and technically inaccurate claims made by the Motioner and his supporters during the technical Meeting. I believe that the attachment, and the minutes of the Meeting, will demonstrate that the TC has proposed a sound approach to the identification of dust hazard zones, and that NFPA 654 should be moved forward to enhance the safety of facilities handling combustible dust.

While I am sure the TC could further improve 654, I still believe that the TC has made major improvements in the document. I am proud enough of our work to believe that workers and companies would be better protected if our version of 654 were released. Regrettably, that release may now be delayed. So, in addition to the technical substantiation, I would like to add that I am gravely concerned that needless fatalities will result as a consequence of such a delay.

Relief requested:

I request that the Standard Council overrule the action taken at the June 9, 2010 Technical Meeting; i.e., overrule the approval of motion 654-3 and affirm the actions of the TC.

W. L. Frank, P.E.
I am voting “Do Not Agree” for the reasons described below.

As I previously shared with the Technical Committee (TC), I am deeply saddened and frustrated by the actions taken at the Technical Meeting in Las Vegas. While I am sure we could further improve 654, I still believe that the TC has made major improvements in the document. I am proud enough of our work to believe that workers and companies would be better protected if our version of 654 were released. Regrettably, that release may now be delayed. I am gravely concerned that needless fatalities will result as a consequence of such a delay. That is an overarching reason for my “Do Not Agree” vote.

I want to be clear that I support the NITMAM process. It provides a valuable mechanism for those having divergent opinions to get their message heard. I was, however, quite surprised and dismayed by how the process was implemented at the NFPA Technical Meeting in Las Vegas. I do not feel that our product – which the TC labored over for two years – received a balanced hearing, based upon a sound, factual analysis. Bluntly put, facts did not seem to matter in the debate or in the decisions at the Technical Meeting. More bluntly, incessant repetition of incorrect or unsubstantiated statements and orotund hyperbole trumped fact and reality far too often.

I am using this substantiation statement to address some of the points raised against the draft NFPA 654 standard at the Technical Meeting and to reiterate the responses provided by those TC members who were present to speak in defense of the standard draft. It is my hope that others will add similar comments in the substantiations submitted with their ballots.

Three motions were voted on at the Technical Meeting and each was passed. While only the third motion, to return the entire standard to the TC, is the subject of this ballot, I also address some of the issues raised in the first two motions, as they served as predicates for the final motion.

1) Use of the term “deflagration” and “dust flash fire”: The TC voted overwhelmingly in support of the usage that we settled upon for these terms. Those speaking against the 654 draft contended that our use of the terms “deflagration” and “dust flash fire” were inconsistent with standard NFPA usage and that “deflagration” should be used in place of “dust flash fire.”

NFPA 68 (Standard on Explosion Protection by Deflagration Venting, the document which “owns” the term “deflagration”) defines a deflagration as:

“Propagation of a combustion zone at a velocity that is less than the speed of sound in the unreacted medium.”

This definition is consistent with the usage in the SFPE Handbook of Fire Protection Engineering, the NFPA Fire Protection Handbook, and other industry publications such as those of the American Institute of Chemical Engineers, Center for Chemical Process Safety. NFPA 1, Fire Code refers to the NFPA 68 definition. The TC believes that our
usage of the term “deflagration” is consistent with its usage in NFPA 68, and these other NFPA and industry references.

NFPA 654 must address three types of combustion hazards: fires in settled layers of dust; flash fires in suspended dust clouds; and explosions that can result when such burning dust clouds are confined in a way that allows pressure to build up. All three of these combustion events are deflagrations, consistent with the use of the term as defined by NFPA. Consequently, the TC elected to use the term “deflagration” as a more generic term to address the entire class of combustion events, while using more specific terms to focus on the different modes of combustion, and to more effectively communicate the severity of the consequences associated with the particular events.

Of particular importance in the revised standard was the need to draw the distinction between:

1. Situations involving rapidly burning and expanding combustible dust clouds where the consequence of concern is that personnel can be engulfed in, and injured by, thermal exposures from the resulting fireball, and

2. Situations where such burning dust clouds are confined in a way that pressure can build to levels that can damage enclosures, including rooms, and personnel can be injured by the physical damage that results when the enclosure bursts.

The TC, consistent with normal usage of the terms, elected to refer to the first event as a “dust flash fire” and the second as an “explosion.”

The Motioner contended that the term “dust flash fire” did not adequately communicate the gravity of the event and proposed that the term “deflagration” should be used instead. To do so, in the opinion of the TC, would risk confusion between the two phenomena: dust flash fires (which the Motioner wants to call “deflagrations”) and explosions (which are also deflagrations). Contrary to the Motioner’s contention, the TC actually felt that the term “dust flash fire” was more evocative of the nature, and the acute severity of the potential consequences, of the event than the more general (and more drily “scientific”) term of “deflagration.”

Note that the NFPA 68 Committee also thought most people did not appreciate the severity of the term deflagration. That is why the title of NFPA 68 was changed to include the word “explosion” in the 2007 edition. In other words, the Committee qualified the phrase "Venting of Deflagrations" in the title by changing it to "Explosion Protection by Deflagration Venting" in the 2007 edition.

All of the above was communicated during the Technical Meeting, along with the fact that the TC overwhelmingly believed that “dust flash fire” was the better, and more communicative, term to use to imbue the distinction between the two events (fireballs and overpressure events) in the minds of the users of the standard.
The Motioner also contended that the term “dust flash fire” was not in common usage within NFPA publications. As communicated during the Technical Meeting, there is adequate precedent within NFPA publications for the use of the term “dust flash fire.”

- NFPA 921 defines “flash fire” to include dust as a fuel.
- NFPA 2112 and 2113 use the NFPA 921 definition of “flash fire” – and the scope statements of the documents specifically refer to “dust flash fires.”
- NFPA 1951 uses the NFPA 921 definition of “flash fire.”
- NFPA 1991 refers to “dust or particulate flash fires.”
- NFPA 484 makes the distinction between the hazards associated with flash fires and explosions involving dust.
- NFPA 704 discusses flash fires from burning dust clouds.

In summary, the TC – through its overwhelming support of the proposed terminology – did not believe that the alternate use of terminology proposed by the Motioner was consistent with general usage of the terms, within and beyond NFPA publications, and did not adequately communicate the gravity of the events sought to be described.

2) Technical basis for the paragraph 6.1 equations: A common complaint was that there was no technical substantiation for the equations in paragraph 6.1. It was repeatedly pointed out by NFPA 654 supporters during the Technical Meeting debate that this assertion was not factually accurate.

For example, supporters of the 654 draft pointed out that the explosion equations were based upon the partial volume venting methodology upon which NFPA 68 is based. Every time this was explained, someone else in the opposition stood up and repeated “There is no technical basis for the equations.” I even pointed out that a vote against our equations would imply that the technology underlying NFPA 68 was not valid.

As to the flash fire equations, it was repeatedly pointed out by the supporters of the NFPA 654 draft that the flash fire equations are derived directly from the laws of thermodynamics and the ideal gas law. Certainly, the technical validity of these laws should not be in dispute at this time.

The Committee believes that the technical bases for the equations are adequately addressed in Annexes A and D of NFPA 654, and in NFPA 68. Their usage and bases were documented in the NFPA 654 ROC report. Furthermore, these equations have been subject to public review via other mechanisms, such as a technical paper presented at the 2010 Loss Prevention Symposium of the American Institute of Chemical Engineers.

3) Our equations are too difficult to use: This was an oft-repeated comment; even though I pointed out that the simple equations could be applied by anyone who could calculate the floor area of a room. NFPA 654 supporters repeatedly pointed out that the simple equations were available, and that the full (more complex) equations only needed to be used when someone could not tolerate the more conservative results from the simple
equations. Each time we did so, someone else stood and just reiterated something to the effect of: “But… they’re too hard.” In the end, hyperbole trumped fact.

While the protestors continued to point to the existing 1/32 inch thickness criterion (in the 2006 edition of NFPA 654) as a simpler alternative to the equations, this criterion – as was pointed out during the meeting – is not straightforward and simple to use when it is applied correctly, as described in the annex to the 2006 edition of 654. Dust layer depths in excess of the thickness criterion are intended to be limited to an area of no more than 5% of the floor area (or an equivalent area of overhead surfaces). Thus, the user still has to be capable of calculating the area of the room. Furthermore, the current 654 provides no guidance on how to assess the significance of varying depths of the dust layer. The thickness criterion requires the measurement of relatively thin layers of dust, a task that is often difficult to do, particularly for areas that are remote and difficult to reach. It can also require a knowledge of the density of the dust layer – again, a difficult to obtain parameter.

Experience has shown that both facility operators and regulators have interpreted and applied the existing thickness criterion in a variety of incorrect fashions.

In addition, it is not the thickness of the dust layer but, rather, the mass of the dust present that determines the damage potential of the dust accumulation. It is the TC’s belief that the existing dust layer thickness criterion provides a poor means of monitoring the mass of dust present in the facility and projecting its injury/damage potential.

It was suggested by the protestors that it would be necessary to remove dust from the facility and weigh it to demonstrate compliance with the mass-based equations. Well, in reality, dust accumulations do need to be removed from the facility on a periodic basis anyway – this is called “housekeeping,” and serves to ensure that dangerous amounts of dust are not present in the facility. Since the dust must be removed periodically anyway, what is wrong with weighing the dust removed and using this information to establish dust accumulation rates and required cleaning frequencies? It is far easier to vacuum dust from elevated surfaces than it is to measure the thickness of the dust on such surfaces… and more conducive to enhancing the safety of the facility.

One TC member is establishing a company-wide program to do this, and is doing so successfully. He is demonstrating the workability of the concepts embodied in, and required to implement, the mass-control-based approach underlying the equations in the draft version of 654. Furthermore, this effort is an off-shoot of a settlement agreement in which OSHA agreed with the concept. It is my understanding that the TC member will include a description of his approach, and successes, in the substantiation filed with his ballot.

Finally, and to reiterate, it is my belief that a preference for the existing thickness criterion is too often based upon a failure to understand how to correctly apply this criterion.
4) Our equations treat all dusts alike: I cannot remember a statement that was more patently false, or more readily accepted by the voting members. Even though the NFPA 654 supporters pointed out that the existing 1/32 inch depth layer criterion (apart from the density adjustment), treats all dusts alike, we were repeatedly met with claims that the equation approach was unique in being a “one-size-fits-all” methodology that did not account for heat of combustion and other dust-specific parameters. I pointed out that the 1/32 inch criterion similarly did not account for dust-specific parameters and that the only equations that did were the more complex, alternative equations provided in the 654 draft.

To be clear – the existing dust layer depth criterion is a “one-size-fits-all” methodology. Only the new, equation-based approach provides the option to reflect the actual characteristics of the dusts and the strength of the building when determining how much dust is required to exceed the thresholds for facility damage and personnel harm.

The protesters were absolutely incorrect in asserting to the membership that the equations are the “one-size-fits-all” alternative. Anyone who truly understood the equations would understand this point. Unfortunately, it appears that some of those who were denigrating the equations were apparently not seeking to first understand them.

5) No standardized method exists for estimating the entrainment fraction: Many protested the assumed value of 0.25 for the entrainment fraction used in the dust mass threshold equations and the fact that there currently is no standardized method for estimating it. The assertion was, commonly, that the equations are invalid without firm, final guidance for determining an appropriate entrainment fraction.

It is agreed that the work remains to provide better guidance for estimating entrainment fractions, and a research project is underway at this time to provide the foundation for this. The TC elected to propose a value of 0.25 until more quantitative guidance is available.

As pointed out in the Technical Meeting, the existing 1/32 inch thickness criterion inherently includes an implicit consideration of entrainment fraction. Annex D of the 2006 edition points out that not all dust is likely to be suspended into the cloud. Further, calculations have shown that, for credible situations, untenable overpressures and fireball volumes could be attained if the entire 1/32 in thick layer (over 5% of the floor area) was suspended into the burning dust cloud.

In other words, the current criterion – which the protestors fervently sought to retain – only yield tolerable results if it is assumed (as discussed in Annex D) that only a fraction of the dust is likely to be entrained.

Clearly, the entrainment fraction must be between 0.0 and 1.0, and historical records of explosions would indicate that it is not likely to be near to either of the endpoint values of the range. The 0.25 default value was selected by the TC to yield results from the explosion overpressure calculation that would match what would have been obtained
using the existing 1/32 inch thickness criterion, for some typical values of the other variables in the equation. It was the TC’s judgment that the 0.25 value provided appropriate conservatism for the interim until a better methodology for estimating the entrainment fraction can be produced.

In conclusion, the equation approach prompts the explicit consideration of entrainment fraction – a physical reality that is obscured by the existing 1/32 inch thickness criterion. The approach contained in the revised NFPA 654 makes obvious the role of the entrainment fraction in the results of the calculations. It provides the basis for a more rigorous treatment of the topic as ongoing research yields a more quantitative basis for selecting the entrainment factor.

It is anticipated that other TC members will provide additional detail on this point in the substantiation of their ballots.

6) The existing 1/32 inch thickness criterion addresses all needed situations: The protestors repeated indicated, either explicitly or implicitly, that the 1/32 inch thickness criterion comprehensively addressed the needs for determining where dust fire and explosion hazards exist. In reality, the scope of application for this criterion in the 2006 edition of NFPA 654 is far more limited than the protestors seem to believe. Paragraph 6.2.3.1 of the 2006 edition of NFPA 654 limits the application of the criterion to determining the extent of the fire or dust explosion hazardous area specifically when separation is used to limit this area:

“When separation is used to limit the fire or dust explosion hazardous area, the hazardous area shall include areas where dust accumulations exceed 1/32 in. (0.8 mm) or areas where dust clouds of a hazardous concentration exist…”

Thus, the protestors’ intent to use the criterion in a general fashion (for example, where safety is based upon segregation or detachment) is not a use that is authorized by the current edition of 654. Further, as recent work has shown, a single criterion to define both fire (dust flash fire) and overpressure (explosion) hazard areas is not feasible or appropriate.

7) There is no basis for the 0.05 fireball exposure probability in the dust flash fire equations: The equations for determining the dust flash fire mass threshold assume that 5% of the room (up to a height of 2 meters) would be filled by the fireball resulting from the entrainment of the dust (after applying the entrainment factor). The protestors questioned the validity of this assumption by the TC.

The 2006 edition of NFPA 654 contains a life safety objective to “protect occupants not in the immediate proximity of the ignition from the effects of fire, deflagration, and explosion…” (emphasis added). However, NFPA 654 has not previously addressed what “in the immediate proximity of the ignition” means. The 0.05 factor in the flash fire equations in 6.1 defines a fraction (5%) of the room volume (from floor level up to an elevation of 2 m) that might be filled with the fireball from the flash fire.
In effect, the 0.05 factor provides a quantitative perspective on what in the immediate proximity means. If the user feels the 0.05 factor is not sufficiently conservative, the results of the calculation can be proportioned downwards as the user sees fit. Annex A describes the significance of the 0.05 factor.

The TC did not feel that a value higher than 5% was appropriate.

8) Equations do not define hazard areas within equipment: In identifying the gaps in the section 6.1 equations, and in touting the benefits of the existing thickness criterion, protestors asserted that the equations only apply to building volumes and do not identify where hazards exist inside of equipment. Granted – they were not intended to do so. Neither, however, was the existing thickness criterion intended to do so. It, too, only addresses the identification of hazard areas inside building volumes. This was pointed out, and ignored, during the debate in the Technical Meeting.

The TC believes that the identification of hazardous conditions within equipment, for example, is already adequately addressed by the standard.

9) There is no loss history to justify making the standard more stringent: This is, perhaps, the most distressing assertion coming from the Technical Meeting. Expressed another way, it could be stated that “the body count tally is not high enough yet to warrant providing more stringent requirements for the control of dust in the work environment.”

There is clearly an industry loss history that illustrates the severity of the dust fire/explosion issue in the US:

- The US Chemical Safety and Hazard Investigation Board (CSB) identified 281 combustible dust incidents between 1980 and 2005 that killed 119 workers and injured 718 others
- OSHA identified 422 dust explosions between 1980 to 2008
- Significant incidents where inadequate housekeeping contributed to the severity of the incident include: Imperial Sugar, West Pharmaceuticals, CTA Acoustics, Hayes Lemmerz, Rouse Polymeric, Jahn Foundry, Malden Mills, and Ford River Rouge
- Since the forest product industry led the fight to return NFPA 654 to the TC, it is worth noting that over 7% of the dust explosion losses reported by FM Global in data sheet 7-76 involved paper dust. (Nearly 39% of the losses were associated with the woodworking industry, but that falls under the scope of NFPA 664).

As to the assertion made by several protestors that no facility in compliance with NFPA 654 has had a dust explosion, I suggest that this is the sort of statement that can be made with the greatest confidence that it can never be proven right or wrong – it just sounds good to whomever makes it, and to whomever accepts it without critical analysis.
I, personally, have never been in a dust-handling facility that complied with the existing requirements of NFPA 654 (with the possible exception of a few pharmaceutical facilities). Unfortunately, there is no roster maintained of which facilities do, or do not, comply with the housekeeping requirements in NFPA 654. However, the data coming out of the OSHA national emphasis program (NEP) for dust hazards indicate that poor housekeeping (i.e., excessive dust accumulations) is a common problem in dust handling facilities.

The TC believes that providing a more definitive means for determining “how dirty is too dirty” will assist both facility personnel and regulators in ensuring cleaner, safer facility operations.

Catastrophic dust fires and explosions are, fortunately, relative rare… but, unfortunately, they impose tragic human and business costs when they do occur. It is likely that the CSB and OSHA statistics cited above far underestimate the frequency of dust fires or explosions which, perhaps due more to luck than skill, failed to propagate to catastrophic, and media-attention garnering, proportions.

The assertion that no facility in compliance with NFPA 654 has had a dust explosion could just as easily, and just as inappropriately, be used to justify loosening the requirements in NFPA 654 to allow even greater dust accumulations, so long as the conceptual threshold body count criterion is not exceeded.

10) Other issues/concerns coming out of the Technical Meeting: There were a number of issues described in other NITMAMs that were not addressed in the Technical Meeting. These matters, addressing other technical content in the draft standard, were unrelated to the issue of the mass threshold equations.

When the protestors saw that they were going to achieve their primary objective – preventing the NFPA 654 draft from moving forward – these other issues were dropped. As a consequence, if the standard is returned to the TC, we will not have received the benefit of having seen these other issues addressed, and hopefully resolved, during the Technical Meeting.

However, these issues will remain as potential stumbling blocks that can be thrown in the path of the TC the next time we return a version of the standard to the Technical Meeting. This “Bring me another rock, as long as it is a different rock” approach will not help the TC in its efforts to produce a document which fosters improved safety in dust-handling facilities.

W. L. Frank
TC Chair
1. Name: John M. Cholin, P.E.

Affiliation: J.M.Cholin Consultants, Inc.

Address: 101 Roosevelt Dr.
Oakland, NJ 07436-2008 USA

2. This action relates to Motion Sequence Numbers:
   - 654-1 to restore the term “Deflagration” in lieu of “Flash Fire” in the document
   - 654-3 to return Section 6.1 back to the Technical Committee
   - 654-6 to accept Comment 654-33, and [See page 4]
   - 654-8 accept proposal 654-7 and 654-10, submitted by John M. Cholin, P.E., J.M.Cholin Consultants, Inc. and,
   - 654-9 submitted by Sam Francis, AF&PA to Return Entire Report back to committee.

3. Argument setting forth grounds for appeal:

654-1

I moved to replace the “dust flash fire” terminology with “dust deflagration” terminology. During the ROP meeting the TC voted to do this. The justification was that the fire protection engineering and building code enforcement communities have an understanding of what a deflagration is and there is a benefit to remaining consistent with this terminology. However, I am told that during one of the subsequent teleconference meetings (I was teaching during the first and did not receive any advanced notice of the second) it was moved to switch it back. I believe that this was a mistake. The membership of NFPA present at the voting agreed with using the term “deflagration” rather than “flash fire”.

654-3

I opposed the new section 6.1 on the basis that it is:
1. incomplete
2. requires the use of a computational assessment that relies upon a parameter whose numerical value we do not know,
3. requires the use of a computational assessment that relies upon a parameter for which there is no current test method for determining its numerical value, and
4. Establishes an acceptable level of employee injury that has not been determined to be acceptable to society.

We all recognized that there was a problem with the 2006 edition in that it did not clearly establish what constituted an “explosion hazard” yet relied upon the phrase “where an explosion hazard exists...” to establish requirements for protection. We have been using the language in the current 6.2.3.1 to back into the determination of where an explosion
hazard exists in the building interior. But there is no explicit language in the document establishing what the TC deems constitutes an “explosion hazard”. This issue was addressed in Proposals 654-7 and 654-10. The ROP indicates that the issue was addressed by the committee by Accepting in Principal. No comment was made because the section on hazard determination was still in a state of flux during the comment period. But the new language in Section 6.1 of the proposed 2010 edition does not address anything but building compartments. So we are still in a situation where we have numerous requirements in Chapter 7 that rely upon the predicate phrase “where an explosion hazard exists” but nowhere does the standard clearly spell out what criteria one should use to determine if a vessel, duct, conveyor, bin bunker, silo, etc. constitutes an explosion hazard. How is the user supposed to know? Does a silo with 1% deflagrable (explosible) particulate mixed in with the big stuff constitute an “explosion hazard”? How about a pneumatic conveyance duct? We can’t expect the operator to perform a PHA to identify the hazards if we do not clearly establish what the TC deems a hazard.

This is an important issue as most of the post-event litigation ultimately boils down to whether the hazard was adequately recognized. Were the requirements of the nationally recognized standard of care, NFPA 654 observed correctly? When there is ambiguity in what constitutes an explosion hazard it is easy for the lawyers to argue that the requirements of Chapter 7 are not applicable. This is a big chink of work that just got forgotten while everybody was grappling with the implications of introducing the hazard assessment relations for the building interior spaces. Unfortunately, it makes the document incomplete.

But there are still problems with the algebraic relations (equations 6.1.2.1, 6.1.2.2, 6.1.3 and 6.1.4). This is not to say that conceptually the document isn’t headed in the right direction, it is, but we are not where we want or need to be yet.

I have a paper recycler with a 20,000 ft² (1,858 m²) facility, 32 feet floor slab to roof deck. The bulk density of the paper dust is approximately 5 lb/ft³. According to 6.2.3.1 of 654-2006 this operator is allowed a dust layer of 0.48 inches in depth. Under 654-2010, using the simple relations in 6.1.2.1 and 6.1.2.2, this operator is allowed 37 kg (82 lb) of dust in the facility for the personnel safety objective and 72 kg (159 lb) for the building structure objective. At 5 lb/ft³ this equates to a layer 0.0098 inches thick for the personnel objective and 0.019 inches thick for the structural objective! This is far less than the level permitted by the current 654. Do we have a loss history that justifies this 50-fold reduction in the permissible dust layer for personnel objective and 25-fold reduction for the structural objective? These relations, 6.1.2.1 and 6.1.2.2, treat all particulates the same regardless of the bulk density, net heat of combustion or KSt. consequently, they produce results that are excessively conservative when used for the majority of the particulates that we encounter.

Now this facility is operated by a client of mine and it actually had a deflagration in the process equipment which vented into the facility interior. The whole event was caught on videotape. There was no propagation of a deflagration fueled by the dust accumulations. I realize that one event does not constitute a trend. But this client has had two similar events at a second facility of the same size and neither of those resulted in propagation. So this client has some faith in 654-2006 but is not convinced that the limits in 654-2010 are valid.
So let's use 6.1.3 and 6.1.4. \( P_{\text{max}} = 6.6 \) bar; \( C_w = 500 g/m^3 \). It's a long-term lease of a spec building in an industrial park so we will assume a wall strength of 40 PSF and a DLF of 1.5 (worst-case). According to equation 6.1.3 \( M_{\text{exp}} = 17,583/\eta_D \) grams. But what value do we use for \( \eta_D \)? At Interfibe (another paper recycler that had a serious explosion several years ago) there were dust accumulations of 4 to 8 inches before the event (from contractor photos) and less than 1 inch after the event (scene documentation). At my client's locations the 3 events we have investigated left the area near the vented deflagration clean – no residual dust. So I guess I shouldn't use the "default value" but assume a worst-case limit of 1.00 for \( \eta_D \). For calculating the permissible dust layer for the structural objective that allows me 17.5 kg over the 1,858 m² area for a total of 9.46 grams per m². This is equivalent to .0046 inch thick layer if the layer is disturbed evenly over the entire interior. Even if I used the default value for \( \eta_D = 0.25 \) we get a layer 4 times that thickness or 0.018 inches in thickness. This is far less than dust layer depths that did not produce a propagating deflagration in 3 out of 3 incidents. For the personnel safety objective, again setting \( \eta_D = 1 \), I get 244.4 kg/\( \eta_D \) of dust permitted over the 1,858 m² area for a total of 131.5 g/m². At 5 lb/ft³ this equates to 0.32 inch in depth, much closer to what I get using 654-2006. Yet this client has 3 events on videotape with dust depths greater than this number and there has been no evidence of deflagration extension into the building interior even though there appeared to be 100% dispersion. If I use \( \eta_D = 0.25 \) I get a dust layer depth of 1.28 inches over the entire interior area. I cannot expect that much dust to not produce a propagating deflagration.

I understand that if the fugitive dust accumulations were limited to a fraction of the area of the facility that this computational method would allow for deeper dust layers in that fractional area. And that is a definite advantage, especially for the denser, more energetic dusts that pose a greater hazard and in process facilities where the fugitive dust layers occupy a fraction of the building. Less dense dusts tend to migrate further and a commensurately larger portion of the facility must be used in the area calculations. If I assume that the dust in the above example only occupies 25% of the total building floor area then the dust layer thickness becomes 5 inches, equal to what blew two employees out the end of the Interfibe building.

Something is wrong here. And there is NO ALTERNATIVE to using these relations in the proposed new standard.

In the current edition of the standard we have the simple measurement in 6.2.3.1 and if we don't think the result is reasonable we can correct for bulk density and net heat of combustion and get a number that is more closely correlated to the actual dust in question. We have no loss history that I can find that suggests that the simple relation in NFPA 654-2006 is insufficiently conservative to allow for safe operations.

With the proposed new edition we have only one alternative, and that is to come up with a value for \( \eta_D \) other than the default value. Minor problem – there is no test method for doing that! Until we have a method for quantifying how much dust is going to be dispersed, regardless of the mechanism, and the fraction of the dispersed material that actually participates in the combustion process we are stuck. Without this information we cannot even use Chapter 5 to develop a hazard determination criterion.

That is why there is so much opposition to these relations right now. When we plug in data for real-life situations they lead to conclusions that are unachievable or are not
supported by the loss history. Furthermore, the tools facility operators need to comply with the requirements that are laid-out in the proposed new standard don’t yet exist.

Before we can use this computational method we must have a method to quantify how much of an accumulated layer is dispersed, regardless of the actual mechanism. We must have a method to quantify how much of the dispersed dust actually burns. We must have a method to quantify the results of the combustion. Le Chatier’s principal tells us that when a chemical reaction does mechanical work it tends not to proceed to completion. Pressurizing a building and accelerating dust is mechanical work. Heating the dust up to AIT absorbs heat. In most of the event reconstructions I have done I find that the combustion process consumes the majority of the oxygen and becomes oxidant-limited. These factors all contribute to likelihood that the initial ignition will lead to a propagating deflagration.

We have not yet had the time to connect all of the dots. We have a partial computational model of what we expect to happen. Now we have to try to verify that model with event data to see if the model is a good predictor of the event. This hasn’t occurred. The initial “reality-checks” I have started with my event data suggests that there are unaddressed issues that we should address before we issue this document as the nationally recognized minimum-compliance standard of care.

The TC has used a 5% probability of flame impingement criterion in the personnel objective relations. As I remember Bob Zalosh’s presentation during the ROP meeting he used 5% as an example. Was it his intent that the TC simply embrace that number as the appropriate value? Is this number acceptable to the stakeholders at the site? Is it acceptable to the workman’s compensation insurance carrier, the owner and the employees? NFPA 654 should not stipulate what this acceptable loss level is – it should be left to the owner/operator and the other stakeholders in the site.

Finally, we need to keep in mind that this standard is not for us – we have been entrusted with writing it for the American public. It is supposed to be a hazard management tool that enforcement personnel, plant managers, facility engineers and consultants can used to manage the hazards encompassed by the scope statement. If we make the document too difficult to use we will make it irrelevant. OSHA is going to develop its own dust explosion hazard regulation which will permit the use of NFPA standards as a performance-equivalent alternative (I hope). We can make our document easy to use or hard to use. If it is easy to use then facility operators will use it and we have the ability to ensure that they are using methods that assure their employees and owners that the hazards are properly addressed. If we don’t, then the document that gets used will be written by some one else and we loose the leadership position. I don’t think there is a more competent, devoted group of people than our TC.

654-6

I moved adoption of comment # 654-33. When the TC decided to move the requirements for return air diversion to the section on air-material separators, a good idea, it managed to loose the requirement for return air diversion and, instead, required deflagration isolation. At Rochester Shoe Tree deflagration isolation was provided on the return air duct. When the dust collector caught fire, smoke, flame and burning filter media was conveyed back into the plant setting the plant on fire, burning 5 employees...
and destroying the building. The deflagration isolation system, that is now **required** by the proposed new edition of 654 and manufactured by a firm that is represented on the TC, never operated. That’s because the deflagration isolation system relies upon pressure sensors for actuation. During a dust collector fire the needed pressure rise does not occur. Furthermore, even if it did actuate, the deflagration isolation system does not provide sufficient agent to offset the nominal 10-25 MW heat release rate of a dust collector fire. Indeed, the Listing of deflagration isolation systems does not contemplate the prevention of flame from vessel fires, only the transitory flow of deflagration flame front.

The only effective means of managing the fire hazard associated with the return of cleaned air from a dust collector is with return air diversion using abort gates. The overwhelming majority of the dust collector explosions we see start off as dust collector fires which transition to deflagration when the automatic bag cleaning feature operates. Only a fraction of the dust collector fires end up as explosions. Accepting Comment 654-33 would fix this error.

**654-8**

I moved that the membership accept proposal 654-7 and 654-10. These two proposals establish definitions for “deflagration hazard” and “explosion hazard” so the requirements in Chapter 7 would actually have an explicit definition to rely upon. These motions were tabled during the annual meeting pending the outcome of the vote on 654-9.

**654-9 submitted by Sam Francis, AF&PA**

I support this motion. There are numerous interdependencies and cross-references within this document. If selected motions to amend are accepted without returning the entire document to the technical committee there is a very real possibility that a disjointed, internally inconsistent document would result, precipitating the need for any number of Tentative Interim Amendments.

**4. Statement of Relief Requested.**

Return the entire 654 report back to committee. There are enough problems with the proposed document that a piece-meal repair is not practical and would likely lead to a document that is either internally inconsistent or incompletely addresses the fire and explosion hazard management issues.
6.1.8* Recycling of air-material separator exhaust shall be permitted when all of the following requirements are met:

1. Combustible or flammable gases or vapors are not present either in the intake or the recycled air in concentrations above applicable industrial hygiene exposure limits or 1% of the LFL, whichever is lower.
2. *Combustible particulate solids are not present in the recycled air in concentrations above applicable industrial hygiene exposure limits or 1% of the MEC, whichever is lower.
3. The oxygen concentration of the recycled air stream is between 19.5 percent and 23.5% by volume.
4. Explosion isolation is provided on the recycle stream per the requirements of 7.1.4. Provisions are in place to automatically divert the returned air to the building exterior in the event of a fire within the air-material separator that can only be restored to normal manually after the system has been shut-down and the source of the fire extinguished.
5. The system includes a method for detecting air-material separator malfunctions.
6. The building where the recycled air is returned meets the fugitive dust control and housekeeping requirements of this standard (chapter 8).
7. Recycle air ducts are inspected and cleaned at least annually.

6.1.9 The provisions of 6.1.8 (3) shall not be applicable for situations where intentional inerting for combustion control is provided:

Substantiation: The proposed change to former section 6.1.3 eliminates the option of return air diversion without any technical justification or documented evidence that explosion isolation is the only acceptable means. Return air diversion using abort gates has a 30 year track record of successfully diverting flame, smoke and toxic combustion product gases for facility interiors and preventing dust collector fires from propagating into the buildings served by the dust collectors. The elimination of this hazard management option will make a quantum increase in the cost of saving the heat value of conveying system air and increase the costs of going-forward operations due to the testing and maintenance requirements for explosion isolation devices. The technical committee considered no loss history data, no research, no case histories in its deliberations. Instead, it assumed a one-size-fits-all approach that, while suitable in some contexts, and necessary in others, is utterly inappropriate, unnecessary and excessively costly in most of the facilities covered by the broad scope of NFPA 654.

Before the TC forces an entire industry to adopt a quantum increase in the expense of managing the hazard it has an obligation to make certain that the change is truly justified. It has not done that. In my view.

The proposed new 6.1.9 should be eliminated as this could allow occupants to become exposed to reduced oxygen concentrations over the course of their normal work day. The oxygen concentrations for combustion control are generally lower than the 19.5% permitted by OSHA.

Committee Meeting Action: Accept in Part
See Committee Action on Comment 654-29 (Log #57) which deleted paragraph 6.1.9 as recommended. The Committee did not accept the recommended modification of item 4.

Committee Statement: The Committee accepted the recommended deletion of paragraph 6.1.9 as part of the action in Comment 654-29 (Log #57).

The submitter's recommendation conflicts with the Committee's intent regarding the application of abort dampers. The Committee has clarified the use of such devices in conjunction with explosion isolation with its action on Comment 654-55 (Log #CC29).

Number Eligible to Vote: 29
Ballot Results: Affirmative: 25 Negative: 3
Ballot Not Returned: 1 Floyd, L.

Explanation of Negative:
CHASTAIN, B.: High speed abort gates have been applied and have worked successfully in the wood products area for many years. The requirement for mechanical or chemical isolation devices without including high-speed abort gates will burden the user community with costs as isolation devices can cost 2 to 3 times the costs of an effective abort gate. The technical committee did not consider loss history, past research or case histories here but adopted a "one-size fits all" approach that is not appropriate for the user community and will ultimately weigh the user community down with excessive costs that are not necessary in all cases.

CHOLIN, J.: See comment on 654-55 (Log #CC29).
THOMAS, T.: Abort Gates have been successfully utilized to prevent dust collector fires from entering buildings for over 30 years.
The current building codes do not establish when a building or room must be protected against a dust explosion. Nor do they set the allowable quantity of a hazardous (combustible) dust in a control area, above which automatic fire suppression is required. Similar to NFPA-30 for liquids, NFPA-654 should establish these limits for dusts. Also, similar to NFPA-30, NFPA-654 should establish an acceptable amount of material in process, in this case, escaped dust.

This proposal clarifies when a Dust Explosion hazard and a Dust Fire Hazard exist in an operation handling combustible dust. The current text mentions these situations but provides no quantitative method to determine how much dust or what distribution of dust results in the hazard. In addition, the current text does not clearly differentiate between dust accumulations requiring electrical classification or those presenting a dust explosion hazard.

This proposal does not set a maximum amount of dust accumulation in a facility. Instead, just as for other materials, it establishes additional protection requirements when a certain amount of accumulation is exceeded.

The criteria for a dust explosion hazard is based on the ability to produce overpressure sufficient to cause building structural failure in the absence of some explosion protection method, typically venting. This is based on the worst case dust concentration, meaning that concentration and its associated maximum deflagration pressure, $P_{\text{max}}$, which give the largest building fill fraction. The worst case fill fraction would come from NFPA-68, section 8.3.4.

The criteria for a dust fire hazard area is based on local fugitive dust accumulation exceeding a mass of 1 kg/m$^2$ on a single square meter of surface between routine scheduled cleaning. This amount of dust, if dispersed, could create an explosible dust cloud of 2 to 4 meters height in a local area. Such a cloud would present a potential for a flash fire with personnel injury as well as ignition of other combustibles. Engineered dust collection and a sufficient routine housekeeping schedule can minimize dust fire hazard areas. When fugitive equipment leaks, then a local accumulation exceeding the 1 kg/m$^2$ criteria between scheduled general cleaning would be cleaned up in shorter times as the local accumulation rate increases.

A small dust fire hazard area would require manual fire protection. If the process results in more than 5% of the fire-separated area (room or floor) exceeding the criteria between routine cleaning, effectively a minimum average of 0.05 kg/m$^2$ or 10%-20% of the MEC, the entire area would be protected with automatic fire suppression. This includes all the areas which experience short term accumulations beyond 1 kg/m$^2$ in a typical 24 hour operation, the longest allowed local cleaning period.

The need for electrically classified equipment for ignition prevention is clearly separated from the explosion and fire hazards. The dust layer thickness, that is accumulation, used to determine electrical classification, is different than those for provision of automatic fire suppression or explosion protection.

Committee Meeting Action: Accept
Number Eligible to Vote: 28
Ballot Results: Affirmative: 20 Negative: 3
Ballot Not Returned: Barton, J., Gillis, J., Hunter, R., Hurst, G., Ness, A.
Explanation of Negative:
CHOLIN, J.: The proposal introduces the term "dust fire" which is not defined nor is it distinguished from the term "deflagration" that has been used for decades in this and numerous other NFPA documents. The submitter has not substantiated the need or advisability for introducing this new term.

The committee proposal is too complex to be routinely enforced by non-engineers for determining if a has are exists or not. The proposed material should be included in an annex to Chapter 5 as a manual of practice.

The committee proposal calculations rely on the concentration producing the maximum pressure, not the minimum concentration that propagates a deflagration flame front, MEC. This leads to under-assessment of the hazard.

SUTTON, J.: While I agree with the concept of establishing hazard areas based on the amounts of dust, I do not agree with using an entrainment factor of 0.25 in these equations as this would result in an increase in the amount of dust allowed in an area and there is not an adequate technical basis for using a 0.25 entrainment factor.

URAL, E.: Change $\eta_D$ value to 1.0 for elevated deposits, and 0.25 for ordinary floor deposits
Comment on Affirmative:
BEATTIE, W.: The .25 factor is not substantiated. This may permit higher than acceptable levels of dust. If any factors
less than 1 is used, the use of the factor should be substantiated by tests.
Add the following new definitions:
3.3.x Dust explosion hazard volumes: those room or building volumes where an unvented deflagration of the entrainable dust mass can result in a reduced pressure, P_{red}, exceeding the ultimate dynamic strength of the weakest structural element not intended to fail.

3.3.x Dust fire hazard areas: those areas where combustible dust accumulation on exposed or concealed surfaces, outside of equipment or containers, can result in personnel injury from thermal dose during a dust deflagration, as well as areas where dust clouds of a hazardous concentration exist during normal operation.

Replace existing 6.1 with the following and renumber as needed:

6.1 General. The provisions of this section shall apply to the overall design of systems that handle combustible dusts.

6.1.1* Those portions of the process and facility where a dust explosion hazard or fire hazard exists shall be protected from the effects of these hazards in accordance with this section as well as Sections 6.2, 6.3, and 6.4 and Chapter 7.

6.1.2* Unless supported by calculations per 6.1.3 and 6.1.4, respectively, dust explosion hazard volumes and dust fire hazard areas shall be deemed to exist when total accumulated dust mass exceeds 1 kg/m² multiplied by 5% of the building or room footprint.

A.6.1.2 This is equivalent to 0.8 mm (1/32 in.) based upon a settled bulk density of 1200 kg/m³ (75 lb/ft³). The following equation provides a means to estimate an equivalent depth from a known value of settled bulk density.

**Insert Equation E654-20 Here**** Eqn A.6.1.2 See P. 11 for Equations

6.1.2.1 All dust accumulated on structures above the lowest footprint shall be evaluated as if accumulated on the lowest footprint.

6.1.2.2 The maximum footprint to be used to calculate the total dust mass shall not exceed 2000 m².

6.1.3 It shall be permitted to evaluate the threshold dust mass establishing a building or room as a dust explosion hazard volume, m_i, per equation 6.1.3.

**Insert Equation E654-21 Here**** Eqn 6.1.3

where
$M_{\text{exp}}$ is the threshold dust mass (g) based upon building damage criterion, $c_w$ is the worst case dust concentration (g/m$^3$) at which the maximum rate-of-pressure-rise results in tests conducted per ASTM E1226, $P_{\text{red}}$ is the allowable pressure (bar g) developed during a deflagration per NFPA 68, $P_{\text{max}}$ is the maximum pressure (bar g) developed in ASTM E1226 tests with the accumulated dust sample, $A_{\text{floor}}$ is the enclosure floor area (m$^2$), $\eta_D$ is the entrainment fraction and H is the enclosure ceiling height (m).

6.1.4 It shall be permitted to evaluate the threshold dust mass establishing an area as a dust fire hazard area, per equation 6.1.4

****Insert Equation E654-22 Here**** Eqn 6.1.4

Where, $M_{\text{fire}}$ is the threshold dust mass (g) based upon personnel fire exposure criterion.

6.1.5* It shall be permitted to assume a default value of 0.25 for the entrainment fraction ($\eta_D$).

6.1.5 A higher value for $\eta_D$ is more appropriate for ducts and small enclosures less than 100 m$^3$ and for enclosures with L/D ratios greater than 5, such as galleries. Research activities are currently in progress to define a technical basis for estimating $\eta_D$.

6.1.6 It shall be permitted to use a lower value of $\eta_D$ based on a risk evaluation that is acceptable to the authority having jurisdiction.

6.1.7 Dust accumulation amounts shall reflect the conditions resulting from routinely scheduled cleaning, and not include short term accumulations cleaned in accordance with Chapter 8.
Equation A.6.1.2

Equivalent Depth (mm) = \frac{1000 \cdot \text{Accumulation (kg} / \text{m}^2)}{\text{BulkDensity (kg} / \text{m}^3)}

Equation 6.1.3

Equivalent Depth (mm) = \frac{1000 \cdot \text{Accumulation (kg} / \text{m}^2)}{\text{BulkDensity (kg} / \text{m}^3)}

Equation 6.1.4

\[ M_{\text{fire}} = 0.05 \left[ \frac{C_w}{1 + P_{\text{max}}} \right] \frac{A_{\text{Floor}}}{\eta D} \]
517 South Ninth Street, Las Vegas, NV 89101 (800) 982-3299

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1 WALTER FRANK: No. Actually, if I may suggest,
2 654-6 is still -- I'm sorry.
3 SHANE CLARY: Okay. Mr. Francis.
4 WALTER FRANK: The motion to send all of 61
5 back --
6 SHANE CLARY: Mr. Frank, please -- please
7 suspend.
8 Mr. Francis, just so we can clarify, is it your
9 intent that you wish at this point to eventually get to
10 your motion 654-9 and not to pursue your other motions
11 at this time?
12 SAM FRANCIS: Yes.
13 SHANE CLARY: And Mr. Cholin, on your
14 motions...
15 JOHN CHOLIN: Mr. Chair, I would like that we
16 table my motions until we consider the motion to return
17 the entire document to committee.
18 SHANE CLARY: Okay. Thank you.
19 Okay. The chair's call that at this point we
20 are going to immediately go to Motion 654-9 which is to
21 return the entire document to the committee.
22 So Mr. Francis, that was your motion?
23 SAM FRANCIS: That's correct, sir. Do I need
24 to make it again?
25 SHANE CLARY: Yeah. You need to officially
make it. I can't make it for you.

SAM FRANCIS: Sam Francis, American Wood Council, moving -- making the motion to return the report to the committee.

(Second.)

SHANE CLARY: Okay. We have a second.

So everyone is clear, we are coming to microphones now, you are discussing to return the whole document to the committee or your reasons for opposing this at this time.

And if that -- and depending on the vote of the motion, if the motion before us is successful, then basically we are done with our discussions today on 654. However, if the motion is not successful, you will then be returning to the motions which are on the docket.

Mr. Francis, please proceed.

SAM FRANCIS: The new section, 6.1, and the equations that we discussed, the determination of risk is the heart of this document. The rest of it is what you do after you determine that you have a risk. And in my Comment 654-34, which isn't a part of this, we're suspending that to discuss sending the whole thing back. I pointed out that references to these equations and their ramifications spread throughout the document.

Once we send back the equations and that sort
of thing, the entire document should go back with it to
be refined and correlated so that when it comes back to
us, the -- the solutions that we have to mitigate risk
match how we determine risk and so forth.

And by the way, I would reiterate now that no
one in all of this debate has offered a single shred of
evidence that the existing document has failed, so we're
not fixing a problem. Therefore, there's no urgency in
bringing the document forward.

The committee's got time to go back and work
the equations, the Chapter 5 performance section, and
the prescriptive determinations. There's time to do
this.

In fact, it's working quite well as is so we're
losing nothing and gaining a great deal because as each
of the supporters of previous motions have pointed out
to you, there's -- there's merit in this intellectual
exercise. This isn't worthless.

The question is: Is it necessary to replace
the prescriptive? Can enforcers enforce with it?
Having sent back those important parts, send the whole
thing back and let it come back to us as a workable
meaningful document. That's my motion.

SHANE CLARY: Okay. Thank you.

Mr. Frank.
WALTER FRANK: I guess we need to clarify something here. In approving the earlier motion to send all of 61 back, the debate focused on the equations. There's actually content in 61 that is totally unrelated to the application in the equations, and that's the focus of some of these other motions.

If we needily leap to -- well, let's -- having decided to send the equations back for further consideration, let's go ahead and rush and decide to send the whole document back. We'll be sending back some issues that have not been discussed here. The committee will not have had any guidance on how to address some of these other non-equation related issues associated with non-equation content in 6.1, and it's going to bring me a rock -- exercise and bring me a rock.

So I am concerned that immediately going to let's send the whole document back, is going to send the document back without giving the committee guidance on how to address these non-equation issues that were the subject of other motions that we're going to be presenting tonight.

SHANE CLARY: Okay. Thank you.

Microphone No. 2.

MARCELO HIRSCHLER: Marcelo Hirschler GBH
International clarification again. We're still talking about Section 6.1. Can you please clarify for us, the motion that we passed, didn't that return all of 6.1 so anything in 6.1 is gone? There's no need for further discussion; is that correct?

SHANE CLARY: 6.1, it goes back to what the existing tech says whatever that may have been. If there was no existing 6.1, at the present time 6.1 is not there.

MARCELO HIRSCHLER: Thank you.

SHANE CLARY: You're welcome.

At this time we'll proceed with any further discussion on 654-9 which is to return the entire document. Seeing I will proceed to the vote.

Mr. Frank, do you have any final comments?

WALTER FRANK: No.

SHANE CLARY: Okay. With that, all in -- I'm sorry.

Microphone No. 1, Mr. Cholin.

JOHN CHOLIN: Yes, Mr. Chairman. My name is John Cholin from JM Cholin Consultants. There is an enormous amount of value in the work that has been done by the TC to get the proposed version this far. We won't be losing that work.

SHANE CLARY: And are you in favor or against
the motion.

JOHN CHOLIN: I'm in favor of the motion to return. I apologize. I'm in favor of the motion to return the document. We won't lose that work. We'll use what we have right now as a starting point and fix the remaining outstanding issues as Mr. Francis noted. I don't know that anybody dealing with deflagrations and explosions can identify a loss where the event occurred in spite of conforming with our current edition of the document.

In every event that I've investigated, the event would have been prevented had we just complied with the current edition of the document. Thank you.

SHANE CLARY: Okay. Thank you.

Seeing no -- okay. Be ready at the mics here.

Okay. Microphone No. 2.

ERDOM URAL: You want phone number?

SHANE CLARY: Say again.

ERDOM URAL: I thought you said phone number.

SHANE CLARY: No. No. I'm sorry. No. I'll get that later.

ERDOM URAL: Erdom Ural speaking for myself and against the NITMAM.

Mr. Francis said why change the document since there are no problems with the 2006 edition. I thought
1 we -- NFPA has a policy of looking at the documents
2 affirming or making improvements continually, not
3 because there is a problem with the -- with the --
4 problem identified.
5
6 If there is a problem identified with the
7 document -- in fact, NFPA has other avenues such as
8 doing a TIA, formal interpretation, so there's these two
9 equations or four simple equations for only a small part
10 of a great amount of work, a great amount of talk that
11 went into consideration when the new edition was
12 developed. So why delay publishing that information?
13
14 Why delay requiring people to comply with that
15 information just because there are nothing wrong
16 identified with the document. Maybe there is. So
17 that's why I request this body to fail the NITMAM and
18 vote against the motion.
19
20 SHANE CLARY: Okay. Thank you.
21
22 Further discussion?
23
24 Mr. Frank.
25
26 WALTER FRANK: I do feel I need to respond.
27 There's been several times the statement has been made
28 no facility that complied with the current version of
29 654 has had an incident. Other than a few
30 pharmaceutical facilities, I've never been in a facility
31 who conformed with the current 654.
So, you know, going into a facility that's blown up and seeing some residual dust and saying well, this facility obviously didn't comply to 654 is not the same -- that's not proof of the assertion that has been made that no facility has ever blown up that conformed to 654. Forgive me. It's a point I had to make.

Most industries are so far away from complying with 654 that we've got a long way to go, and it's the committee's intent that this revision would help people move in that right direction. And hopefully when we get a chance to work on it again, we'll still head in that direction. Thank you.

SHANE CLARY: Okay. Thank you.

At this time we'll proceed to the vote. Again, it's to return the entire report to the committee. All in favor of the motion, please signify by raising your hands.

(Raising Hands.)

SHANE CLARY: Thank you.

All opposed?

(Raising Hands.)

SHANE CLARY: And the motion carries.

Thank you, Mr. Frank.

And at this time we'll be taking a ten-minute comfort break, a ten-minute comfort break. Thank you.
Maynard, Mary

Subject: FW: Appeals to NFPA Standards Council re NFPA 654 on various CAMs

From: walt frank [mailto:wlf@frankrisk.com]
Sent: Wednesday, July 07, 2010 7:34 PM
To: Maynard, Mary
Cc: Cronin, Amy; Colonna, Guy; Beach, Denise; Moreau-Correia, Jeanne
Subject: RE: Appeals to NFPA Standards Council re NFPA 654 on various CAMs

Please forward this to the Standards Council.

I find it necessary to protest, in the strongest possible terms, any consideration by the Standards Council of the appeals regarding CAM 654-6 and CAM 654-8. Both of these motions were tabled at the Technical Meeting.

The motions were tabled because they were perceived to be part of section 6.1 of NFPA 654. Section 6.1 had already been voted (under CAM 654-9) to be returned to the TC. Subsequently, based upon a suggestion from the floor, the Technical Meeting Chair decided that these motions were moot points, and they were tabled.

As I pointed out to the Chair, the portions of the standard affected by CAM 654-6 and CAM 654-8 were, in fact, not part of section 6.1. They were, rather, mischaracterized as such solely because the author of CAM 654-9 erroneously claimed that they were in 6.1 (as he had based his NITMAM on the structure of the document that appeared in the ROP, not the ROC version of the document).

I clearly pointed this out to the Chair, and advised that these, and other similar motions, should be heard so that the TC could be informed by the debate from the floor. I did not prevail.

Mr. Cholin had an opportunity to protest from the floor the tabling of his motions, CAM 654-6 and CAM 654-8. He elected not to do so. Now he seeks a back door way of getting them heard anyway. In fact, this is all the more egregious when you consider the following quote from the meeting transcripts:

“JOHN CHOLIN: Mr. Chair, I would like that we table my motions until we consider the motion to return the entire document to committee.”

Now Mr. Cholin seeks to appeal the very action that he proposed from the floor. I would like to say that I find this incredible but, regrettably, I no longer can.

As to CAM 654-6 and CAM 654-8, I came to the Technical Meeting fully prepared to speak against these motions. I was denied that opportunity.

Now, as a self-employed consultant, in order to fairly represent my views on these motions I must incur the additional out-of-pocket expenses, and lost revenue opportunities, involved in attending the Standards Council meeting.

As I will be explaining in greater detail in a letter yet this week, I can no longer justify the expenses associated with attending this meeting.

While I have served diligently on the NFPA 654 TC committee for 16 years, and have chaired the committee for 7 years, I must confess that I am rapidly losing confidence in the NFPA standards-making process. The inclusion of the appeals pertaining to CAM 654-6 and CAM 654-8 on the agenda for the Standards Council meeting only serves to accelerate that loss in confidence.

Walt Frank. P.E.
President
Frank Risk Solutions, Inc.
1110 Shallcross Avenue
2. This action relates to Motion Sequence Numbers:
   - 654-1 to restore the term “Deflagration” in lieu of “Flash Fire” in the document
   - 654-3 to return Section 6.1 back to the Technical Committee
   - 654-6 to accept Comment 654-33, and
   - 654-8 accept proposal 654-7 and 654-10, submitted by John M. Cholin, P.E., J.M.Cholin Consultants, Inc. and,
   - 654-9 submitted by Sam Francis, AF&PA to Return Entire Report back to committee.

3. Argument setting forth grounds for appeal:

654-1

I moved to replace the “dust flash fire” terminology with “dust deflagration” terminology. During the ROP meeting the TC voted to do this. The justification was that the fire protection engineering and building code enforcement communities have an understanding of what a deflagration is and there is a benefit to remaining consistent with this terminology. However, I am told that during one of the subsequent teleconference meetings (I was teaching during the first and did not receive any advanced notice of the second) it was moved to switch it back. I believe that this was a mistake. The membership of NFPA present at the voting agreed with using the term “deflagration” rather than “flash fire”.

654-3

I opposed the new section 6.1 on the basis that it is:
1. incomplete
2. requires the use of a computational assessment that relies upon a parameter whose numerical value we do not know,
3. requires the use of a computational assessment that relies upon a parameter for which there is no current test method for determining its numerical value, and
4. Establishes an acceptable level of employee injury that has not been determined to be acceptable to society.

We all recognized that there was a problem with the 2006 edition in that it did not clearly establish what constituted an “explosion hazard” yet relied upon the phrase “where an explosion hazard exists…” to establish requirements for protection. We have been using the language in the current 6.2.3.1 to back into the determination of where an explosion
hazard exists in the building interior. But there is no explicit language in the document establishing what the TC deems constitutes an “explosion hazard”. This issue was addressed in Proposals 654-7 and 654-10. The ROP indicates that the issue was addressed by the committee by Accepting in Principal. No comment was made because the section on hazard determination was still in a state of flux during the comment period. But the new language in Section 6.1 of the proposed 2010 edition does not address anything but building compartments. So we are still in a situation where we have numerous requirements in Chapter 7 that rely upon the predicate phrase “where an explosion hazard exists” but nowhere does the standard clearly spell out what criteria one should use to determine if a vessel, duct, conveyor, bin bunker, silo, etc. constitutes an explosion hazard. How is the user supposed to know? Does a silo with 1% deflagrable (explosible) particulate mixed in with the big stuff constitute an “explosion hazard”? How about a pneumatic conveyance duct? We can’t expect the operator to perform a PHA to identify the hazards if we do not clearly establish what the TC deems a hazard.

This is an important issue as most of the post-event litigation ultimately boils down to whether the hazard was adequately recognized. Were the requirements of the nationally recognized standard of care, NFPA 654 observed correctly? When there is ambiguity in what constitutes an explosion hazard it is easy for the lawyers to argue that the requirements of Chapter 7 are not applicable. This is a big chink of work that just got forgotten while everybody was grappling with the implications of introducing the hazard assessment relations for the building interior spaces. Unfortunately, it makes the document incomplete.

But there are still problems with the algebraic relations (equations 6.1.2.1, 6.1.2.2, 6.1.3 and 6.1.4). This is not to say that conceptually the document isn’t headed in the right direction, it is, but we are not where we want or need to be yet.

I have a paper recycler with a 20,000 ft² (1,858 m²) facility, 32 feet floor slab to roof deck. The bulk density of the paper dust is approximately 5 lb/ft³. According to 6.2.3.1 of 654-2006 this operator is allowed a dust layer of 0.48 inches in depth. Under 654-2010, using the simple relations in 6.1.2.1 and 6.1.2.2, this operator is allowed 37 kg (82 lb) of dust in the facility for the personnel safety objective and 72 kg (159 lb) for the building structure objective. At 5 lb/ft³ this equates to a layer 0.0098 inches thick for the personnel objective and 0.019 inches thick for the structural objective! This is far less than the level permitted by the current 654. Do we have a loss history that justifies this 50-fold reduction in the permissible dust layer for personnel objective and 25-fold reduction for the structural objective? These relations, 6.1.2.1 and 6.1.2.2, treat all particulates the same regardless of the bulk density, net heat of combustion or KSt. Consequently, they produce results that are excessively conservative when used for the majority of the particulates that we encounter.

Now this facility is operated by a client of mine and it actually had a deflagration in the process equipment which vented into the facility interior. The whole event was caught on videotape. There was no propagation of a deflagration fueled by the dust accumulations. I realize that one event does not constitute a trend. But this client has had two similar events at a second facility of the same size and neither of those resulted in propagation. So this client has some faith in 654-2006 but is not convinced that the limits in 654-2010 are valid.
So let’s use 6.1.3 and 6.1.4. \( P_{\text{max}} = 6.6 \text{ bar}; C_w = 500\text{g/m}^3 \). It’s a long-term lease of a spec building in an industrial park so we will assume a wall strength of 40 PSF and a DLF of 1.5 (worst-case). According to equation 6.1.3 \( M_{\text{exp}} = 17,583/\eta_D \) grams. But what value do we use for \( \eta_D \)? At Interfibe (another paper recycler that had a serious explosion several years ago) there were dust accumulations of 4 to 8 inches before the event (from contractor photos) and less than 1 inch after the event (scene documentation). At my client’s locations the 3 events we have investigated left the area near the vented deflagration clean – no residual dust. So I guess I shouldn’t use the “default value” but assume a worst-case limit of 1.00 for \( \eta_D \). For calculating the permissible dust layer for the structural objective that allows me 17.5 kg over the 1,858 m\(^2\) area for a total of 9.46 grams per m\(^2\). This is equivalent to .0046 inch thick layer if the layer is disturbed evenly over the entire interior. Even if I used the default value for \( \eta_D = 0.25 \) we get a layer 4 times that thickness or 0.018 inches in thickness. This is far less than dust layer depths that did not produce a propagating deflagration in 3 out of 3 incidents. For the personnel safety objective, again setting \( \eta_D = 1 \), I get 244.4 kg/\( \eta_D \) of dust permitted over the 1,858 m\(^2\) area for a total of 131.5 g/m\(^2\). At 5 lb/ft\(^3\) this equates to 0.32 inch in depth, much closer to what I get using 654-2006. Yet this client has 3 events on videotape with dust depths greater than this number and there has been no evidence of deflagration extension into the building interior even though there appeared to be 100% dispersion. If I use \( \eta_D = 0.25 \) I get a dust layer depth of 1.28 inches over the entire interior area. I cannot expect that much dust to not produce a propagating deflagration.

I understand that if the fugitive dust accumulations were limited to a fraction of the area of the facility that this computational method would allow for deeper dust layers in that fractional area. And that is a definite advantage, especially for the denser, more energetic dusts that pose a greater hazard and in process facilities where the fugitive dust layers occupy a fraction of the building. Less dense dusts tend to migrate further and a commensurately larger portion of the facility must be used in the area calculations. If I assume that the dust in the above example only occupies 25% of the total building floor area then the dust layer thickness becomes 5 inches, equal to what blew two employees out the end of the Interfibe building.

Something is wrong here. And there is NO ALTERNATIVE to using these relations in the proposed new standard.

In the current edition of the standard we have the simple measurement in 6.2.3.1 and if we don’t think the result is reasonable we can correct for bulk density and net heat of combustion and get a number that is more closely correlated to the actual dust in question. We have no loss history that I can find that suggests that the simple relation in NFPA 654-2006 is insufficiently conservative to allow for safe operations.

With the proposed new edition we have only one alternative, and that is to come up with a value for \( \eta_D \) other than the default value. Minor problem – there is no test method for doing that! Until we have a method for quantifying how much dust is going to be dispersed, regardless of the mechanism, and the fraction of the dispersed material that actually participates in the combustion process we are stuck. Without this information we cannot even use Chapter 5 to develop a hazard determination criterion.

That is why there is so much opposition to these relations right now. When we plug in data for real-life situations they lead to conclusions that are unachievable or are not
supported by the loss history. Furthermore, the tools facility operators need to comply with the requirements that are laid-out in the proposed new standard don’t yet exist.

Before we can use this computational method we must have a method to quantify how much of an accumulated layer is dispersed, regardless of the actual mechanism. We must have a method to quantify how much of the dispersed dust actually burns. We must have a method to quantify the results of the combustion. Le Chatier’s principal tells us that when a chemical reaction does mechanical work it tends not to proceed to completion. Pressurizing a building and accelerating dust is mechanical work. Heating the dust up to AIT absorbs heat. In most of the event reconstructions I have done I find that the combustion process consumes the majority of the oxygen and becomes oxidant-limited. These factors all contribute to likelihood that the initial ignition will lead to a propagating deflagration.

We have not yet had the time to connect all of the dots. We have a partial computational model of what we expect to happen. Now we have to try to verify that model with event data to see if the model is a good predictor of the event. This hasn’t occurred. The initial “reality-checks” I have started with my event data suggests that there are unaddressed issues that we should address before we issue this document as the nationally recognized minimum-compliance standard of care.

The TC has used a 5% probability of flame impingement criterion in the personnel objective relations. As I remember Bob Zalosh’s presentation during the ROP meeting he used 5% as an example. Was it his intent that the TC simply embrace that number as the appropriate value? Is this number acceptable to the stakeholders at the site? Is it acceptable to the workman’s compensation insurance carrier, the owner and the employees? NFPA 654 should not stipulate what this acceptable loss level is – it should be left to the owner/operator and the other stakeholders in the site.

Finally, we need to keep in mind that this standard is not for us – we have been entrusted with writing it for the American public. It is supposed to be a hazard management tool that enforcement personnel, plant managers, facility engineers and consultants can used to manage the hazards encompassed by the scope statement. If we make the document too difficult to use we will make it irrelevant. OSHA is going to develop its own dust explosion hazard regulation which will permit the use of NFPA standards as a performance-equivalent alternative (I hope). We can make our document easy to use or hard to use. If it is easy to use then facility operators will use it and we have the ability to ensure that they are using methods that assure their employees and owners that the hazards are properly addressed. If we don’t, then the document that gets used will be written by some one else and we loose the leadership position. I don’t think there is a more competent, devoted group of people than our TC.

654-6

I moved adoption of comment # 654-33. When the TC decided to move the requirements for return air diversion to the section on air-material separators, a good idea, it managed to loose the requirement for return air diversion and, instead, required deflagration isolation. At Rochester Shoe Tree deflagration isolation was provided on the return air duct. When the dust collector caught fire, smoke, flame and burning filter media was conveyed back into the plant setting the plant on fire, burning 5 employees
and destroying the building. The deflagration isolation system, that is now **required** by the proposed new edition of 654 and manufactured by a firm that is represented on the TC, never operated. That’s because the deflagration isolation system relies upon pressure sensors for actuation. During a dust collector fire the needed pressure rise does not occur. Furthermore, even if it did actuate, the deflagration isolation system does not provide sufficient agent to offset the nominal 10-25 MW heat release rate of a dust collector fire. Indeed, the Listing of deflagration isolation systems does not contemplate the prevention of flame from vessel fires, only the transitory flow of deflagration flame front.

The only effective means of managing the fire hazard associated with the return of cleaned air from a dust collector is with return air diversion using abort gates. The overwhelming majority of the dust collector explosions we see start off as dust collector fires which transition to deflagration when the automatic bag cleaning feature operates. Only a fraction of the dust collector fires end up as explosions. Accepting Comment 654-33 would fix this error.

**654-8**

I moved that the membership accept proposal 654-7 and 654-10. These two proposals establish definitions for “deflagration hazard” and “explosion hazard” so the requirements in Chapter 7 would actually have an explicit definition to rely upon. These motions were tabled during the annual meeting pending the outcome of the vote on 654-9.

**654-9 submitted by Sam Francis, AF&PA**

I support this motion. There are numerous interdependencies and cross-references within this document. If selected motions to amend are accepted without returning the entire document to the technical committee there is a very real possibility that a disjointed, internally inconsistent document would result, precipitating the need for any number of Tentative Interim Amendments.

**4. Statement of Relief Requested.**

Return the entire 654 report back to committee. There are enough problems with the proposed document that a piece-meal repair is not practical and would likely lead to a document that is either internally inconsistent or incompletely addresses the fire and explosion hazard management issues.
Technical Committee on Handling and Conveying of Dusts, Vapors, and Gases, 654-15

Revise definitions for Dust Explosion Hazard Volume changed to Dust Explosion Hazard Area and Dust Deflagration hazard area changed to Dust Flash Fire Hazard Area and add a new definition for flash fire from NFPA 2113. Modify text in Chapter 6 and elsewhere throughout the document to reflect these changes in the terms.

3.3.x* Flash Fire. A fire that spreads rapidly through a diffuse fuel, such as dust, gas, or the vapors of an ignitable liquid, without the production of damaging pressure. [extracted from 2113]

A.3.3.16 Flash Fire. A flash fire requires an ignition source and a hydrocarbon or an atmosphere containing combustible, finely divided particles (e.g., coal dust or grain) having a concentration greater than the lower explosive limit of the chemical. Both hydrocarbon and dust flash fires generate temperatures from 1000°F to 1900°F (538°C to 1038°C). The intensity of a flash fire depends on the size of the gas, vapor, or dust cloud. When ignited, the flame front expands outward in the form of a fireball. The resulting effect of the fireball's energy with respect to radiant heat significantly enlarges the hazard areas around the point of ignition.

3.3.x Defflagration Hazard Area

3.3.x.1* Dust Explosion hazard volume area. A room or building volume where an unvented deflagration of the entrainable dust mass can result in a pressure exceeding the strength of the weakest structural element not intended to fail.

A.3.3.1 Dust Explosion Hazard Area. See NFPA 68, Standard on Explosion Protection by Deflagration Venting for evaluating strength of enclosures.

3.3.x.2 Dust Flash Fire hazard area. An area where combustible dust accumulation on exposed or concealed surfaces, outside of equipment or containers, can result in personnel injury from thermal dose during a dust deflagration, as well as any areas where dust clouds of a hazardous concentration exist during normal operation. A propagating deflagration yields a flash fire through the hazard area.

4.6.1.1 The facility, combustible particulate processes, and human element programs shall be designed, constructed, equipped, and maintained to protect occupants not in the immediate proximity of the ignition from the effects of fire—deflagration; and explosion for the time needed to evacuate, relocate, or take refuge.

6.1.1* Those portions of the process and facility where a dust explosion hazard or flash fire hazard exists shall be protected from the effects of these hazards in accordance with this section as well as Sections 6.2, 6.3, and 6.4 and Chapter 7.

6.1.2* Unless supported by calculations per 6.1.3 and 6.1.4, dust explosion hazard volume areas and dust flash fire hazard areas shall be deemed to exist when the total accumulated dust mass exceeds 1 kg/m² multiplied by the lesser of (A) 5% of the building or room footprint or (B) 100 m² the thresholds calculated in 6.1.2.1 or 6.1.2.2, respectively. See Comment 654-18 (Log#CC31) for 6.1.2.1 and 6.1.2.2.

6.1.3* It shall be permitted to evaluate the threshold dust mass establishing a building or room as a dust explosion hazard volume area, mexp, per equation 6.1.3. See Comment 654-18 (Log#CC31) for equation 6.1.3.

6.1.4* It shall be permitted to evaluate the threshold dust mass, mfire, establishing an area as a dust flash fire hazard area, per equation 6.1.4. See Comment 654-18 (Log#CC31) for equation 6.1.4.

6.2 Use of Segregation

6.2.2.1 Physical barriers that are erected to segregate dust flash fire hazard areas shall be a minimum 1 hour fire separation assembly, including seals at all penetrations of floors, walls, ceilings, or partitions.

6.2.2.2 Physical barriers that are erected to segregate dust explosion hazard volume areas shall be designed to preclude failure of those barriers during a dust explosion per NFPA 68, Standard on Explosion Protection by Deflagration Venting.

6.2.3 Use of Separation

6.2.3.1* When separation is used to limit the dust flash fire hazard area, the required separation distance between the flash fire hazard area identified in 6.1 and surrounding exposures shall be determined by the following:

(1) Engineering evaluation that addresses the properties of the materials
(2) Type of operation
(3) Amount of material likely to be present outside the process equipment
(4) Building design
(5) Nature of surrounding exposures

6.2.3.9.2 When separation is used to limit the dust flash fire hazard area, in no case shall the required separation distance determined in 6.2.3.1 be less than 30 ft (9 m).

6.2.3.43 When separation is used, housekeeping, fixed dust collection systems employed at points of release, and compartmentation shall be permitted to be used to limit the extent of the dust fire hazard area.

6.3.8 Penetrations. Where floors, walls, ceilings, and other partitions have been erected to control the spread of fire or explosions deflagrations, penetrations in these structures shall be sealed to maintain their fire resistance endurance rating and maintain physical integrity in an explosion, where required deflagration. (See 7.6.5.)

6.3.10* Floors and load-bearing walls that are exposed to dust explosion hazard volumes shall be designed to preclude failure during a dust explosion as determined according to NFPA 68, Standard on Explosion Protection by Deflagration Venting.

6.4* Explosion Protection.

6.4.1* A dust explosion hazard volume area, as specified in 6.1, shall be provided with explosion protection in accordance with NFPA 69, Standard on Explosion Prevention Systems or NFPA 68, Standard on Explosion Protection by Deflagration Venting.

12.2.3.3 Filter media shall not be replaced with an alternative type unless a thorough evaluation of the fire and explosion hazards has been performed, documented, and reviewed by management.

A.4.1.2 The design basis generally includes, but is not limited to, the general scope of work, design criteria, process description, material flow diagrams, basis for deflagration protection; basis for fire and explosion protection systems, and the physical and chemical properties of the process materials. The design generally includes, but is not limited to, equipment layouts, detailed mechanical drawings, specifications, supporting engineering calculations, and process and instrumentation diagrams.

A.4.2.1 One method by which this requirement can be satisfied is with a process hazard analysis conducted in accordance with the methods outlined by the AIChE Center for Chemical Process Safety in Guidelines for Hazard Evaluation Procedures.

To determine if a dust deflagration explosion hazard exists, consider the following:

A.7.12.2.2 Some systems are designed to operate at solids concentrations that pose no fire or explosion deflagration risk. Such systems include nuisance dust exhaust systems and the downstream side of the last air–material separator in the pneumatic conveying system.

A.7.14 Abort gates cannot be relied upon to manage explosions deflagrations. See also Annex C.

A.9.8.2(6) Loaders should never be parked or left unattended in the dust explosion hazard or dust flash fire hazard area.

B.4.4 (3) Fireball exiting a vented component, which is a severe flash fire hazard to the plant and personnel located in the vicinity of the deflagration vent opening.

B.7 Limitations of Flame Front Diversers.

Flame front diverters can divert deflagration flames by directing them to the atmosphere. However, these devices do have limitations. If the air-moving device is located downstream of the flame front diverter, an explosion originating upstream of the diverter can propagate past it because of the deflagration flames being sucked into the downstream side, despite the open diverter cover. Also, tests suggest that some diverters could be ineffective in completely diverting a deflagration involving a hybrid mixture whose vapors exceed the LFL, regardless of the location of the air-moving device. Nevertheless, in both situations where a flame front diverter allows propagation, the deflagration severity in the system is expected to be reduced.

Wherever the exposure hazard has been referenced to a "volume", make the change to an "area." Wherever the consequence from the hazard results from thermal exposure it will be referred to as a "flash fire hazard" and wherever the consequence from the hazard results in an overpressure it will be referred to as an "explosion hazard." This direction applies to correct other Committee actions regardless of the terms used in those actions.

Substantiation: For the purpose of defining where the requirements of the standard apply, the Committee clarified the definitions for Dust Explosion Hazard Volume and Dust Deflagration Hazard Area. These terms establish the two hazardous conditions caused by combustible dusts if not controlled - flash fires that threaten personnel and explosions that challenge the structural integrity of the building. To better correlate the personnel threat, the Committee added the definition for flash fire based upon the work of the Committee on Flash Fire Protective Garments as defined in NFPA 2113. The other changes made to text in Chapter 6 were for consistency with the introduction of the flash fire concept through the defined term. Wherever the exposure hazard has been referenced to a "volume", the term has been changed to an "area." Wherever the consequence from the hazard results from thermal exposure it will be referred to...
as a "flash fire hazard" and wherever the consequence from the hazard results in an overpressure it will be referred to as an "explosion hazard." The action in this comment also incorporates changes to the definition for combustible dust based on the action in Comment 654-4 (Log# 26). See also the action on Comment 654-44 (Log# CC12) regarding additional text for paragraph 6.2.3 and the action on Comment 654-45 (Log# 39) that has been incorporated into the revision of paragraph 6.4.1. This also incorporates the action from Comment 654-43 (Log#14).

Committee Meeting Action: Accept
Number Eligible to Vote: 29
Ballot Results: Affirmative: 26 Negative: 2
Ballot Not Returned:  1 Floyd, L.

Explanation of Negative:

CHASTAIN, B.: There was a vote during the Baltimore meetings and the vote substantiated using "deflagration" to fire hazard. On a subsequent teleconference with different participants the same person who wanted "flash fire" in the document as opposed to "deflagration" brought it up for a second vote. The vote passed as all the original voters present in Baltimore were not present on the teleconference due to prior commitments. Not enough time was allowed in scheduling teleconferences after the Baltimore meeting for all attendees to make arrangements to attend as prior business commitments prevented them from participating in subsequent teleconferences. Furthermore, the term deflagration has been used now for over 5 years in NFPA 654, the user community has trained their people to recognize what a "deflagration hazard" is and now the user community will be required to retrain their employees to the new term, "Flash Fire" which does nothing to improve the document adds confusion and costs to the user community.

CHOLIN, J.: The need for this definition has not been clearly demonstrated. The term deflagration is used in all of the other NFPA document that deal with preventing dust explosions as well as the model building codes. The term "flash fire" suggests something that is transitory in nature and could lead readers to conclude that it is not a significant hazard to personnel. The fact that NFPA 2113 has defined this term should not serve as a basis for abandoning the term deflagration which has been used for the past 40 or so years and is widely understood. furthermore, the notion of "damaging pressure" is relative and unenforceable. The pressure that damages a person is very different than the pressure that is sufficient to exceed the acceptable damage threshold for a building of piece of process equipment. There are numerous examples of cases where occupants have been thrown off of catwalks or down onto the floor by the pressure front of a deflagration which did not produce damage to the building - the people involved were damaged.

The language reflected in the ballot is NOT what the majority of the TC adopted during its 2 day meeting in Baltimore. During that meeting the TC adopted the use of the term "deflagration" rather than "dust fire" and "flash fire" because there was a 40-year history of using the term deflagration, the term "deflagration" is used in all of the other NFPA dust standards as well as the model building codes and the term connotes something that is very different from the "fire" that conventional fire protection assets are designed to address. Then the TC continued its meetings with a series of teleconferences that were scheduled on such short notice that only a fraction of the committee was free to participate. The ballot reflects decisions made by this small fraction. The practice of revisiting these definitions in the context of teleconferences scheduled such that only a fraction of the committee was free to participate deprived the full committee of the opportunity to participate in the discussions and the voice vote. This is NOT what is intended in the Rules Governing Committee Projects and erodes the integrity of the NFPA Codes and Standards writing process.
The current building codes do not establish when a building or room must be protected against a dust explosion. Nor do they set the allowable quantity of a hazardous (combustible) dust in a control area, above which automatic fire suppression is required. Similar to NFPA-30 for liquids, NFPA-654 should establish these limits for dusts. Also, similar to NFPA-30, NFPA-654 should establish an acceptable amount of material in process, in this case, escaped dust.

This proposal clarifies when a Dust Explosion hazard and a Dust Fire Hazard exist in an operation handling combustible dust. The current text mentions these situations but provides no quantitative method to determine how much dust or what distribution of dust results in the hazard. In addition, the current text does not clearly differentiate between dust accumulations requiring electrical classification or those presenting a dust explosion hazard.

This proposal does not set a maximum amount of dust accumulation in a facility. Instead, just as for other materials, it establishes additional protection requirements when a certain amount of accumulation is exceeded.

The criteria for a dust explosion hazard is based on the ability to produce overpressure sufficient to cause building structural failure in the absence of some explosion protection method, typically venting. This is based on the worst case dust concentration, meaning that concentration and its associated maximum deflagration pressure, $P_{\text{max}}$, which give the largest building fill fraction. The worst case fill fraction would come from NFPA-68, section 8.3.4.

The criteria for a dust fire hazard area is based on local fugitive dust accumulation exceeding a mass of 1 kg/m$^2$ on a single square meter of surface between routine scheduled cleaning. This amount of dust, if dispersed, could create an explosible dust cloud of 2 to 4 meters height in a local area. Such a cloud would present a potential for a flash fire with personnel injury as well as ignition of other combustibles. Engineered dust collection and a sufficient routine housekeeping schedule can minimize dust fire hazard areas. When fugitive equipment leaks, then a local accumulation exceeding the 1 kg/m$^2$ criteria between scheduled general cleaning would be cleaned up in shorter times as the local accumulation rate increases.

A small dust fire hazard area would require manual fire protection. If the process results in more than 5% of the fire-separated area (room or floor) exceeding the criteria between routine cleaning, effectively a minimum average of 0.05 kg/m$^2$ or 10%-20% of the MEC, the entire area would be protected with automatic fire suppression. This includes all the areas which experience short term accumulations beyond 1 kg/m$^2$ in a typical 24 hour operation, the longest allowed local cleaning period.

The need for electrically classified equipment for ignition prevention is clearly separated from the explosion and fire hazards. The dust layer thickness, that is accumulation, used to determine electrical classification, is different than those for provision of automatic fire suppression or explosion protection.

**Committee Meeting Action:** Accept

**Number Eligible to Vote:** 28

**Ballot Results:** Affirmative: 20 Negative: 3

**Ballot Not Returned:** 5 Barton, J., Gillis, J., Hunter, R., Hurst, G., Ness, A.

**Explanation of Negative:**

CHOLIN, J.: The proposal introduces the term "dust fire" which is not defined nor is it distinguished from the term "deflagration" that has been used for decades in this and numerous other NFPA documents. The submitter has not substantiated the need or advisability for introducing this new term.

The committee proposal is too complex to be routinely enforced by non-engineers for determining if a hazard exists or not. The proposed material should be included in an annex to Chapter 5 as a manual of practice.

SUTTON, J.: While I agree with the concept of establishing hazard areas based on the amounts of dust, I do not agree with using an entrainment factor of 0.25 in these equations as this would result in an increase in the amount of dust allowed in an area and there is not an adequate technical basis for using a 0.25 entrainment factor.

URAL, E.: Change $\eta_{D}$ value to 1.0 for elevated deposits, and 0.25 for ordinary floor deposits

**Comment on Affirmative:**

BEATTIE, W.: The .25 factor is not substantiated. This may permit higher than acceptable levels of dust. If any factors
less than 1 is used, the use of the factor should be substantiated by tests.
Add the following new definitions:

3.3.x Dust explosion hazard volumes: those room or building volumes where an unvented deflagration of the entrainable dust mass can result in a reduced pressure, \( P_{\text{red}} \), exceeding the ultimate dynamic strength of the weakest structural element not intended to fail.

3.3.x Dust fire hazard areas: those areas where combustible dust accumulation on exposed or concealed surfaces, outside of equipment or containers, can result in personnel injury from thermal dose during a dust deflagration, as well as areas where dust clouds of a hazardous concentration exist during normal operation.

Replace existing 6.1 with the following and renumber as needed:

6.1 General. The provisions of this section shall apply to the overall design of systems that handle combustible dusts.

6.1.1* Those portions of the process and facility where a dust explosion hazard or fire hazard exists shall be protected from the effects of these hazards in accordance with this section as well as Sections 6.2, 6.3, and 6.4 and Chapter 7.

6.1.2* Unless supported by calculations per 6.1.3 and 6.1.4, respectively, dust explosion hazard volumes and dust fire hazard areas shall be deemed to exist when total accumulated dust mass exceeds 1 kg/m\(^2\) multiplied by 5% of the building or room footprint.

A.6.1.2 This is equivalent to 0.8 mm (\(\frac{1}{32}\) in.) based upon a settled bulk density of 1200 kg/m\(^3\) (75 lb/ft\(^3\)). The following equation provides a means to estimate an equivalent depth from a known value of settled bulk density.

****Insert Equation E654-20 Here****  
**Eqn A.6.1.2**  
See P. 11 for Equations

6.1.2.1 All dust accumulated on structures above the lowest footprint shall be evaluated as if accumulated on the lowest footprint.

6.1.2.2 The maximum footprint to be used to calculate the total dust mass shall not exceed 2000 m\(^2\).

6.1.3 It shall be permitted to evaluate the threshold dust mass establishing a building or room as a dust explosion hazard volume, \( m_i \), per equation 6.1.3.

****Insert Equation E654-21 Here****  
**Eqn 6.1.3**

where
M\textsubscript{exp} is the threshold dust mass (g) based upon building damage criterion, 
c\textsubscript{w} is the worst case dust concentration (g/m\textsuperscript{3}) at which the maximum rate-of-pressure-rise results in tests conducted per ASTM E1226, 
P\textsubscript{red} is the allowable pressure (bar g) developed during a deflagration per NFPA 68, 
P\textsubscript{max} is the maximum pressure (bar g) developed in ASTM E1226 tests with the accumulated dust sample, 
A\textsubscript{floor} is the enclosure floor area (m\textsuperscript{2}), 
\eta\textsubscript{D} is the entrainment fraction 
and H is the enclosure ceiling height (m).

6.1.4 It shall be permitted to evaluate the threshold dust mass establishing an area as a dust fire hazard area, per equation 6.1.4

****Insert Equation E654-22 Here****  Eqn 6.1.4

Where, M\textsubscript{fire} is the threshold dust mass (g) based upon personnel fire exposure criterion.

6.1.5* It shall be permitted to assume a default value of 0.25 for the entrainment fraction (\eta\textsubscript{D}).

A.6.1.5 A higher value for \eta\textsubscript{D} is more appropriate for ducts and small enclosures less than 100 m\textsuperscript{3} and for enclosures with L/D ratios greater than 5, such as galleries. Research activities are currently in progress to define a technical basis for estimating \eta\textsubscript{D}.

6.1.6 It shall be permitted to use a lower value of \eta\textsubscript{D} based on a risk evaluation that is acceptable to the authority having jurisdiction.

6.1.7 Dust accumulation amounts shall reflect the conditions resulting from routinely scheduled cleaning, and not include short term accumulations cleaned in accordance with Chapter 8.
Equation A.6.1.2

\[
\text{Equivalent\ Depth (mm)} = \frac{1000 \cdot \text{Accumulation (kg / m}^2\text{)}}{\text{BulkDensity (kg / m}^3\text{)}}
\]

Equation 6.1.3

\[
\text{Equivalent\ Depth (mm)} = \frac{1000 \cdot \text{Accumulation (kg / m}^2\text{)}}{\text{BulkDensity (kg / m}^3\text{)}}
\]

Equation 6.1.4

\[
M_{\text{fire}} = 0.05 \left( \frac{C_w}{1 + P_{\text{max}}} \right) \frac{A_{\text{Floor}} \delta}{\eta_D}
\]
3.3.4 Combustible Dust. A combustible particulate solid that has a surface area to volume ratio greater than that of a 420 micron diameter sphere and presents a fire or deflagration hazard when suspended in air or some other oxidizing medium over a range of concentrations, regardless of particle size or shape.

A combustible particulate solid that has a surface area to volume ratio greater than that of a 420 micron diameter sphere and presents a fire or deflagration hazard when suspended in air or some other oxidizing medium over a range of concentrations, regardless of particle size or shape.

A3.3.4 Combustible Dust. Dusts traditionally have been defined as a material 420 µm or smaller (capable of passing through a U.S. No. 40 standard sieve). Combustible particulates with an effective diameter of less than 420 µm should be deemed to fulfill the criterion of the definition. However, flat platelet-shaped particles, flakes, or particles of fibers with lengths that are large compared to their diameter usually do not pass through a 420 µm sieve yet still pose a deflagration hazard. Furthermore, many particulates accumulate electrostatic charge in handling, causing them to attract each other, forming agglomerates. Often agglomerates behave as if they were larger particles, yet when they are dispersed they present a significant hazard. Consequently, it can be inferred that any particle that has a surface area to volume ratio greater than that of a 420 µm diameter sphere should also be deemed can behave as a combustible dust.

The determination of whether a sample of material is a combustible dust should be based on a screening test methodology such as the draft ASTM E 1226 screening method. Alternatively, a standardized test method such as ASTM E 1515, Standard Test Method for Minimum Explosible Concentration of Combustible Dusts or ASTM E 1226, Test Method for Pressure and Rate of Pressure Rise for Combustible Dusts may be used for this determination.

Any time a combustible dust is processed or handled, a potential for deflagration exists. The degree of deflagration hazard varies, depending on the type of combustible dust and the processing methods used.

A dust explosion has the following four requirements:

1. Combustible dust
2. Dust dispersion in air or other oxidant at or exceeding the minimum explosible concentration (MEC)
3. Ignition source such as an electrostatic discharge, an electric current arc, a glowing ember, a hot surface, welding slag, frictional heat, or a flame
4. Confinement

Evaluation of the hazard of a combustible dust should be determined by the means of actual test data. Each situation should be evaluated and applicable tests selected. The following list represents the factors that are sometimes used in determining the deflagration hazard of a dust:

1. Minimum explosible concentration (MEC)
2. Minimum ignition energy (MIE)
3. Particle size distribution
4. Moisture content as received and as tested
5. Maximum explosion pressure at optimum concentration
6. Maximum rate of pressure rise at optimum concentration
7. KSt (normalized rate of pressure rise) as defined in ASTM E 1226, Test Method for Pressure and Rate of Pressure Rise for Combustible Dusts
8. Layer ignition temperature
9. Dust cloud ignition temperature
10. Limiting oxidant concentration (LOC) to prevent ignition
11. Electrical volume resistivity
12. Charge relaxation time
13. Chargeability

Substantiation: The revised text does not achieve the goal of providing useful criteria for characterizing combustible particulate solids as potential combustible dusts, particularly for fibrous or flake particles. The proposed use of equivalent surface area to volume ratio is not appropriate for thin flakes or fibers, which could in theory have infinite length with thicknesses well within the range of normal process materials while still meeting the established criteria for a combustible dust. In addition, the task of determining the surface area to volume ratio would be difficult for irregularly-shaped particles. This comment takes an alternative approach, referencing a screening test method in the annex material to characterize combustible dusts on the basis of established test criteria rather than a comparison to an arbitrary size threshold.

Committee Meeting Action: Accept in Principle
3.3.4* Combustible Dust. A combustible particulate solid that has a surface area to volume ratio greater than that of a 420 micron diameter sphere and presents a fire or explosion deflagration hazard when suspended in air or the process oxidizing medium over a range of concentrations, regardless of particle size or shape.

Modify the Annex as shown:

3.3.4 Combustible Dust. Dusts traditionally have been defined as a material 420 µm or smaller (capable of passing through a U.S. No. 40 standard sieve). For consistency with other standards, 500 microns (capable of passing through a U.S. No. 35 standard sieve) is now considered an appropriate size criterion. Particle surface area to volume ratio is a key factor in determining the rate of combustion. Combustible particulates with a minimum dimension more than 500 µm generally have a surface area to volume ratio that is too small to pose a deflagration hazard. Flat platelet-shaped particles, flakes, or fibers with lengths that are large compared to their diameter often do not pass through a 500 µm sieve yet still could pose a deflagration hazard. Many particulates accumulate electrostatic charge in handling, causing them to attract each other, forming agglomerates. Often agglomerates behave as if they were larger particles, yet when they are dispersed they present a significant hazard. Consequently, it can be inferred that any particle that has a surface area to volume ratio greater than that of a 420 µm diameter sphere should also be deemed a combustible dust minimum dimension of less than 500 microns could behave as a combustible dust if suspended in air.

The determination of whether a sample of material is a combustible, exploisable, dust should be based on a screening test methodology such as provided in the draft ASTM E 1226, Test Method for Pressure and Rate of Pressure Rise for Combustible Dusts Alternatively, a standardized test method such as ASTM E 1515, Standard Test Method for Minimum Explosible Concentration of Combustible Dusts can be used to determine dust explosibility.

There is some possibility that a sample will result in a false positive in the 20 Liter sphere when tested by the ASTM E1226 screening test or ASTM E1515 test. This is due to the high energy ignition source over-driving the test. When the lowest ignition energy allowed by either method still results in a positive result, the owner/operator can elect to determine whether the sample is a combustible dust with screening tests performed in a larger scale (greater than or equal to 1m³) enclosure, which is less susceptible to over-driving and thus will provide more realistic results.

This possibility for false positives has been known for quite some time and is attributed to “over-driven” conditions that exist in the 20 liter chamber due to the use of strong pyrotechnic igniters. For that reason, the reference method for explosibility testing is based on 1 m3 chamber, and the 20 L chamber test method is calibrated to produce results comparable to those from the 1-m3 chamber for most dusts. In fact, the US standard for 20 L testing (E 1226) states “The objective of this test method is to develop data that can be correlated to those from the 1-m3 chamber (described in ISO 6184/1 and VDI 3673)...” ASTM E 1226 further states “Because a number of factors (concentration, uniformity of dispersion, turbulence of ignition, sample age, etc.) can affect the test results, the test vessel to be used for routine work must be standardized using dust samples whose KSt and Pmax parameters are known in the 1-m3 chamber.”

NFPA 68 also recognizes this problem and addresses it stating “the 20 L test apparatus is designed to simulate results of the 1m3 chamber; however, the igniter discharge makes it problematic to determine KSt values less than 50 bar-m/sec. Where the material is expected to yield KSt values less than 50 bar-m/sec, testing in a 1 m3 chamber might yield lower values.”

Any time a combustible dust is processed or handled, a potential for deflagration exists. The degree of deflagration hazard varies, depending on the type of combustible dust and the processing methods used.

A dust deflagration has the following four requirements:

1) Combustible dust
2) Dust dispersion in air or other oxidant
3) Sufficient concentration at or exceeding the minimum exploable concentration (MEC)
4) Sufficiently powerful ignition source such as an electrostatic discharge, an electric current arc, a glowing ember, a hot surface, welding slag, frictional heat, or a flame

If the deflagration is confined and produces a pressure sufficient to rupture the confining enclosure the event is, by definition, an “explosion”.

Evaluation of the hazard of a combustible dust should be determined by the means of actual test data. Each situation should be evaluated and applicable tests selected. The following list represents the factors that are sometimes used in determining the deflagration hazard of a dust:

1) Minimum exploable concentration (MEC)
2) Minimum ignition energy (MIE)
3) Particle size distribution
4) Moisture content as received and as tested
5) Maximum explosion pressure at optimum concentration
(6) Maximum rate of pressure rise at optimum concentration
(7) KSt (normalized rate of pressure rise) as defined in ASTM E 1226, Test Method for Pressure and Rate of Pressure Rise for Combustible Dusts
(8) Layer ignition temperature
(9) Dust cloud ignition temperature
(10) Limiting oxidant concentration (LOC) to prevent ignition
(11) Electrical volume resistivity
(12) Charge relaxation time
(13) Chargeability

It is important to keep in mind that as particulate is processed, handled or transported the particle size generally decreases due to particle attrition. Consequently, it is often necessary to evaluate the explosibility of the particulate at multiple points along the process. Where process conditions dictate the use of oxidizing media other than air (nominally taken as 21% oxygen and 79% nitrogen), certain of the above tests should be conducted in the appropriate process specific medium.

Committee Statement: The Committee accepted the revised definition of combustible dust as proposed but expanded on the supporting text in the annex. The Committee acknowledged the traditional 420 micron size particles formerly used as the size threshold but also noted that more commonly in other current standards that 500 microns is considered the more appropriate standard particle size. This action also includes the action on Comment 654-6 (Log #49), which has been incorporated into the final action for this comment.

Number Eligible to Vote: 29
Ballot Results: Affirmative: 26 Negative: 2
Ballot Not Returned: 1 Floyd, L.
Explanation of Negative:

CHASTAIN, B.: Requiring users to test a bin full of wooden spherical balls 3 inches in diameter to determine if they are combustible is unseasonable and requires undue costs on the user community.

CHOLIN, J.: See reasons for negative ballot for 654-6 (Log #49). We do not object to the use of a 500 micron effective diameter size criterion. However, as the definition currently stands a facility operator with a silo full of golf balls would be required to submit a sample of golf balls to a lab for a "go/no-go" test and maintain those test results as part of its process hazard analysis. It is not appropriate that NFPA standards cause the profligate waste of financial resources of those operations falling under the scope of the document.
Technical Committee on Handling and Conveying of Dusts, Vapors, and Gases,

**Recommendation:** Revise the definition of Combustible Dust as shown:

3.3.4* Combustible Dust. A combustible particulate solid that has a surface area to volume ratio greater than that of a 420 micron diameter sphere and presents a fire or deflagration hazard when suspended in air or some other oxidizing medium over a range of concentrations, regardless of particle size or shape.

Annex A.3.3.4 remains unchanged.

**Substantiation:** The Committee revised the definition for combustible dust to include the surface area to volume ratio consideration as an important characteristic when determining whether a combustible particulate solid is a combustible dust. This concept is currently included in the annex but has been incorporated into the definition to highlight its relevance when characterizing combustible particulate solids as potential combustible dusts.

**Committee Meeting Action:** Accept

**Number Eligible to Vote:** 28

**Ballot Results:** Affirmative: 21 Negative: 2

**Ballot Not Returned:** 5 Barton, J., Gillis, J., Hunter, R., Hurst, G., Ness, A.

**Explanation of Negative:**

KIRBY, D.: I think air should be the oxidant in this definition. Also, regardless of size or shape should be dropped.

URAL, E.: The revised text is useless because it produces incredible results. For example:

1) Consider a piece of string, 279 microns (11 mils) diameter and 1 kilometer long. The revised text makes it a combustible dust.

2) Consider a metal or plastic sheet 139 microns (5.5 mils) thick and a square mile area. The revised text makes it a combustible dust.

3) Consider a Porous or Rough Sphere of 4200 microns (5/32 inch) diameter that has actual surface equal to 10 times the smooth enveloping surface area. The revised text makes it a combustible dust.
6.1. All in favor of the motion, please signify by raising hands.

(Raising Hands.)

SHANE CLARY: Thank you.

All opposed?

(Raising Hands.)

SHANE CLARY: The motion carries.

We now move to 654-4. I'll wait for Mr. Francis.

SAM FRANCIS: Sam Francis, American Wood Council, representing --

SHANE CLARY: Wait a minute. Microphone No. 5, please.

SAM FRANCIS: Thank you. Sam Francis, American Wood Council, representing Stan Lancey of the American Forest and Paper Association. Well, frankly in light of what just happened, I move to accept Comment 654 which is going to further address these equations but sending it back -- but let me just cut to the chase.

SHANE CLARY: Okay. Mr. Francis, 654 which -- what...

SAM FRANCIS: I don't care what you do with this. You resolve the equation problems and I'm going to move on my final comments to send the entire document back because you just cut out the heart.
SHANE CLARY: Yeah. Are you pursuing 654-24 at this time?

SAM FRANCIS: I just moved it.

SHANE CLARY: Okay. Do we have a second.

(SEcond.)

SHANE CLARY: Okay. We're speaking right now on 654-24.

SAM FRANCIS: And it's all been said.

SHANE CLARY: Well, we have a motion. Any --

Mr. Frank, any comments.

WALTER FRANK: Well, it would seem to be a moot point in terms of the impact. I would point out that the motion addresses some proposals. It talks about removing equations from -- that were in the proposals that are no longer in the comment version so it's little -- it's a little confusing which equations we're talking about anyway.

SHANE CLARY: Okay. Thank you.

WALTER FRANK: Yeah. I guess it's a moot point.

SHANE CLARY: Okay.

ERDOM URAL: Point of order. With the previous motion aren't all these moot? Section 6134, 5, 8 are all gone? So there's no --

SHANE CLARY: Hold on, Doctor.
WALTER FRANK: No. Actually, if I may suggest, 654-6 is still -- I'm sorry.

SHANE CLARY: Okay. Mr. Francis.

WALTER FRANK: The motion to send all of 61 back --

SHANE CLARY: Mr. Frank, please -- please suspend.

Mr. Francis, just so we can clarify, is it your intent that you wish at this point to eventually get to your motion 654-9 and not to pursue your other motions at this time?

SAM FRANCIS: Yes.

SHANE CLARY: And Mr. Cholin, on your motions...

JOHN CHOLIN: Mr. Chair, I would like that we table my motions until we consider the motion to return the entire document to committee.

SHANE CLARY: Okay. Thank you.

Okay. The chair's call that at this point we are going to immediately go to Motion 654-9 which is to return the entire document to the committee.

So Mr. Francis, that was your motion?

SAM FRANCIS: That's correct, sir. Do I need to make it again?

SHANE CLARY: Yeah. You need to officially
July 20, 2010

TO THE NFPA STANDARDS COUNCIL:

I am the chair of the Technical Committee on the Handling and Conveying of Dusts, Vapors, and Gases – the TC responsible for NFPA 654. Along with the balance of the committee, I have worked for over two years to deliver a revision of NFPA 654 that would provide needed enhancements in combustible dust safety within industry.

The availability of that improved guidance has now been delayed by at least two years, based upon the actions taken during the NFPA Technical Meeting in Las Vegas. Like many on the TC, I view what transpired in Las Vegas to have been a regrettable abuse of a valid mechanism provided by NFPA to allow minority opinions to be heard. I discuss this further, below.

I have filed three appeals, on my own behalf, for actions taken at the Technical Meeting. These were forwarded to the Council by e-mail on 6/29/10. I stand behind these appeals, but I will not be able to attend the Standards Council meeting on August 4. As a self-employed consultant, I have found that the cost of participating on (and in my case, chairing) an NFPA TC can be considerable, both in terms of the out-of-pocket expenses and the cost of lost revenue opportunities. The costs become even more unreasonable when the person writing the checks learns how easily the value of the real and sweat-equity investments can be invalidated by special interest groups (as discussed herein). Seeking to control costs as best I can, and having been forewarned that the Standards Council’s vote in support of the actions taken in Las Vegas was almost a forgone conclusion, I am regretfully unable to attend the August 4 meeting to speak in support of my appeals.

I request that Dr. Erdem Ural be permitted to speak on my behalf at the meeting.

Let me be clear that I support the NITMAM process. It provides a valuable mechanism for those having divergent opinions to have their message heard. I was, however, quite surprised and dismayed by the outcome of the Las Vegas meeting. I do not feel that the product, which the TC labored over for two years, received a balanced hearing based upon sound, factual analysis. Bluntly put, facts did not seem to matter, but rhetoric did, and the standard was returned to the TC.

I want to carefully point out that my statements below do not pertain specifically to any individual, or any particular statement made. However, in general, I believe that many of the statements made in the NITMAMs and in the Las Vegas Technical Meeting in support of the motions to amend were wholly unsubstantiated, technically ill-considered, or just plain false. From the perspective of someone who actually understands the issues under debate, it is hard to infer whether the misstatements made in the meeting came as a consequence of the commenter not trying hard enough to really understand the technical issues, or whether they were willful attempts to mislead. In either case, many of the assertions made (and, apparently made in
If one has any confidence in the system for vetting and approving TC members, it must be assumed that the TC represents a cross section of experts on the topic. What we witnessed in Las Vegas was the scuttling of two years of dedicated, and informed, efforts on the part of the TC. And this was achieved by a handful of special interests swaying the far less informed voting membership through the coordinated repetition of emotional appeals, hyperbole, false statements, and at least one cheap shot directed towards me and NFPA staff implying improprieties with respect to scheduling of the conference calls required to finish the TC’s deliberations on the ROC draft.

Further, one NITMAM submitter continued to confuse the ROP version of the standard with the ROC version, and commented on matters that were no longer in the final draft of the standard under review in Las Vegas. This confusion resulted in a number of NITMAMs being summarily tabled, which has prompted another appeal to the Council – I will return to this matter later.

My three appeals are self-supporting in their technical detail. I will not comment further on them here.

While I am sure the TC could further improve NFPA 654, I still believe that the TC has made major improvements in the document. I am proud enough of our work to believe that workers and companies would have been better protected had our version of 654 been released. Regrettably, that release is now likely to be delayed. I am gravely concerned that needless fatalities will result as a consequence of such a delay.

I will close with the following commentary on other NFPA 654-related appeals that have been filed with the Standards Council:

**Mr. Francis’ appeal:**

Mr. Francis discusses the fact that a number of motions were tabled after passage of the motion to return paragraph 6.1 to the TC. This was based upon the perception that the material covered by the tabled motions was part of paragraph 6.1. In actuality, this was a misconception fostered by Mr. Francis’ error in framing parts of his NITMAMs based upon the content of the ROP version of the standard. The material covered by the tabled motions was not in paragraph 6.1 in the final ROC version of the standard.

For what it is worth, the meeting transcript does not reveal that there was a motion to table. The decision to table was a consensus decision worked out between the Technical Meeting Chair, Mr. Francis, and Mr. Cholin. I will return to this topic when I discuss Mr. Cholin’s appeal.

Mr. Francis makes reference to “some questionable scheduling of conference calls by the committee” even while admitting that he “was not party to any of those calls.” He later justifies returning the standard to the TC based, in part, on “procedural errors” – clearly another reference to the canard that there were irregularities with regard to how the final conference calls were
scheduled as the TC was completing the ROC version of the standard (as implied by Mr. Chastain from the floor in Las Vegas).

I request that the Standards Council review this matter and make a determination as to whether or not NFPA policies with respect to the scheduling of meetings were correctly followed.

**Mr. Chastain’s appeal:**

Mr. Chastain does not appear to be appealing anything. I see no relevance in Mr. Chastain’s filing to the matters at hand.

**Mr. Cholin’s appeal:**

Mr. Cholin proposes a hypothetical situation in the second to last paragraph on page 2 of his document. He contrasts the dust layer thickness allowed at a hypothetical paper recycle facility, as determined using the thickness criterion in the 2006 edition of NFPA 654 compared to the thickness calculated from the equations proposed for the NFPA 654 revision. He cites a 50X decrease in allowed thickness using the proposed equations. This is an apples to oranges comparison.

The hypothetical example assumes a room with a floor area of 20,000 ft\(^2\). The thickness criterion in the 2006 edition of NFPA 654 would allow a dust depth of 0.48 inches (after adjusting for the bulk density of the dust). However, it is the intent of the standard that this depth of dust only is permitted to accumulate on 5% of the floor area (1000 ft\(^2\)).

Regrettably, this 5% restriction only appears in an Annex in the standard and, thus, is not mandatory. If the 5% restriction is ignored, this hypothetical example would allow the accumulation of 4000 lbs of combustible dust in the room. This is a sobering thought, considering that only a few hundred pounds of dust are sufficient to blow the room apart, or to fill the room with a life-threatening fireball. This is one example of the weaknesses in the current version of the standard, which the TC sought to remedy.

If we take the results of the dust mass calculation that Mr. Cholin cites, and distribute the dust over the same 1000 ft\(^2\), the resulting dust layer depth would be 0.2 inches. This is a 2.5X reduction, not a 50X reduction, when the calculations share a fair and common basis. This is the sort of hyperbole that the proponents of the revised standard have had to deal with.

While I am confident that Mr. Cholin did not seek to do so, he has likely demonstrated what makes the vague and non-protective thickness criterion so enticing to its devotees.

**Mr. Cholin seeks to appeal the tabling of several of his motions during the Las Vegas meeting, specifically CAM 654-6 and CAM 654-8.**

As described above in the discussion of Mr. Francis’ appeal, the motions were tabled because they were perceived to be part of paragraph 6.1 of NFPA 654. Section 6.1 had already been voted (under CAM 654-9) to be returned to the TC. Subsequently, based upon a suggestion from
the floor, the Technical Meeting Chair decided that these motions were moot points, and they were tabled.

As I pointed out to the Chair, the portions of the standard affected by CAM 654-6 and CAM 654-8 were, in fact, not part of section 6.1. They were, rather, mischaracterized as such solely because Mr. Francis erroneously claimed that they were in 6.1 (as he had based his NITMAM on the structure of the document that appeared in the ROP, not the ROC version of the document).

I clearly pointed this out to the Chair, and advised that these, and other similar motions, should be heard so that the TC could be informed by the debate from the floor. I did not prevail.

Mr. Cholin had an opportunity to protest from the floor the tabling of his motions. He elected not to do so. Now he seeks a back door way of getting them heard anyway. In fact, this is all the more unsettling when you consider the following quote from the meeting transcripts:

“JOHN CHOLIN: Mr. Chair, I would like that we table my motions until we consider the motion to return the entire document to committee.”

Now Mr. Cholin seeks to appeal the very action that he proposed from the floor. As to CAM 654-6 and CAM 654-8, I came to the Technical Meeting fully prepared to speak against these motions. I was denied that opportunity. Since I am unable to attend the Standards Council meeting, I will again be denied the opportunity to speak against the motions should the Standards Council decide to consider them. I protect most vigorously any further consideration of these motions.

W. L. Frank, P.E.
President, Frank Risk Solutions, Inc.
Chair of the Technical Committee on the Handling and Conveying of Dusts, Vapors, and Gases
Item 10-8-15
STAFF NOTE RE: SPRINKLER and ANTIFREEZE TIAs:

There are 6 TIAs relating to sprinkler systems and antifreeze. Agenda item 10-8-15d is a presentation outlining new fire test data before discussion of the TIAs. The tests will be completed just before the Council meeting, and the results may or may not impact opinions on the TIAs.

Although the complete TIA packages are included in the agenda (Agenda items 10-8-15 through 10-8-20), below is a summary of the results to date, minus emergency nature data (passed for each TIA). The TCC voting is not completed, but that data will be presented in the supplemental agenda or handouts at the meeting.

TIA BALLOT RESULTS ARE AS FOLLOWS:

<table>
<thead>
<tr>
<th>TIA</th>
<th>DOC</th>
<th>RESULT</th>
<th>AG:DIS:AB</th>
<th># Needed to PASS</th>
<th>% Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>994</td>
<td>13D</td>
<td>Fail</td>
<td>18:7:0</td>
<td>19</td>
<td>72%</td>
</tr>
<tr>
<td>995</td>
<td>13R</td>
<td>Fail</td>
<td>17:8:0</td>
<td>19</td>
<td>68%</td>
</tr>
<tr>
<td>1000</td>
<td>13</td>
<td>Failing (due 7/14/10)</td>
<td>12:7:1</td>
<td>16</td>
<td>63%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TIA</th>
<th>DOC</th>
<th>RESULT</th>
<th>AG:DIS:AB</th>
<th># Needed to PASS</th>
<th>% Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>996</td>
<td>13D</td>
<td>Fail</td>
<td>12:14:0</td>
<td>19</td>
<td>46%</td>
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<tr>
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<td>13R</td>
<td>Fail</td>
<td>13:12:0</td>
<td>19</td>
<td>52%</td>
</tr>
<tr>
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<td>13</td>
<td>Pass</td>
<td>19:5:1</td>
<td>19</td>
<td>79%</td>
</tr>
</tbody>
</table>
NFPA Safety Alert Regarding Antifreeze in Residential Sprinklers

Background
Automatic fire sprinkler systems with antifreeze solutions have more than 60 years of successful use in commercial applications and an equally successful experience since they have been in use in residential applications. The home is the place where most fire fatalities occur, and when home sprinklers are present, the risk of dying in a home fire decreases by 83%. NFPA supports and urges the expanded use of residential sprinklers as the most effective way to prevent fire injury and death in the home and other residential occupancies.

While NFPA emphasizes that residential sprinklers are and remain reliable and effective, a recent fire incident involving a sprinkler system that contained a high concentration antifreeze solution, has raised concerns surrounding the combustibility of antifreeze solutions in residential sprinkler systems. The incident involved a grease fire in a kitchen where a sprinkler system with a reported 71.2% concentration of antifreeze deployed. The fire resulted in a single fatality and serious injury to another person.

Following this incident, NFPA initiated a research project with the Fire Protection Research Foundation and an initial set of fire tests were also conducted. Based on information learned from these efforts, NFPA is issuing this interim safety alert and recommendations (box at right) and has initiated additional fire tests to gain further information on antifreeze solution performance under various fire scenarios.

NFPA expects to provide additional guidance on antifreeze solutions before the cold weather months.

Key Findings of Initial Research fire tests
Based on testing conducted, 70/30% glycerin and 60/40% propylene glycol antifreeze solutions may provide an unacceptable risk of harm to occupants in certain types of fire scenarios, in particular kitchen grease fires. There were successful tests where kitchen grease fires were extinguished or contained with a 50/50 % glycerin solution but NFPA felt there should be additional testing to more fully understand if there is a risk associated with 50/50% glycerin solution.

Important safety information and NFPA guidance regarding antifreeze in residential fire sprinklers
Fire sprinklers are extremely effective fire protection devices, significantly reducing deaths, injuries and property loss from fire.

These systems should not be disconnected.

Until the results of further testing on antifreeze are available, NFPA recommends the following:

- If you have, or are responsible for, a residential occupancy with a fire sprinkler system, contact a sprinkler contractor to check and see if there is antifreeze solution in the system.
- If there is an antifreeze solution in the system, as an interim measure, drain the system and replace it with water only. Problems associated with freezing of sprinkler pipes can be mitigated by alternative measures such as insulation. NFPA hopes to provide further guidance based on additional testing before the winter freezing months.
- If you are putting in a new residential sprinkler system, design and install a system that does not require an antifreeze solution.

Basic Fire Safety Tips to Prevent Kitchen Fires
All consumers should take important fire safety precautions regarding kitchen fires.

- Have and maintain smoke alarms in your home.
- Pay attention when you are cooking.
- Should you have a grease fire on your stovetop, smother the fire by sliding a lid over the pan and turn off the stovetop. Leave the pan covered until the pan cools completely.
- Never put water on a grease fire or use a fire extinguisher on a grease fire.
- Never attempt to carry a flaming pan across the kitchen.

For more information on this topic visit http://www.nfpa.org/antifreeze.
1. Add a new 7.6.1 as follows:

**7.6.1 Dwelling Units.** Antifreeze concentrations in excess of 50% by volume shall not be permitted within the dwelling unit portions of sprinkler systems.

   **7.6.1.1 Only factory premixed solutions shall be permitted.**

2. **Renumber the remainder of the section accordingly.**

**Submitter’s Substantiation.** As a result of information obtained through a report from the Fire Protection Research Foundation titled *Antifreeze Solutions in Home Fire Sprinkler Systems* and data compiled in a UL document titled *Fire Test Data Summary for Residential Sprinklers Discharging Antifreeze Mixtures* sufficient technical documentation now exists to highlight safety concerns and knowledge gaps regarding the provisions permitting antifreeze in sprinkler systems protecting dwelling units.

   Until such time that additional research is conducted to satisfy the concerns and knowledge gaps the safe use of antifreeze solutions in high concentrations within sprinkler systems protecting dwelling units cannot be assured.

   Mandating the use of factory premix solutions is a quality control measure to ensure the concentrations are not used above the established limit.

**Emergency Nature:**

1. The proposed TIA intends to correct a previously unknown existing hazard.
2. The proposed TIA intends to offer to the public a benefit that would lessen a recognized (known) hazard or ameliorate a continuing dangerous condition or situation.

**Attachments:**

- Fire Protection Research Foundation titled *Antifreeze Solutions in Home Fire Sprinkler Systems* dated May 28, 2010
- UL document titled *Fire Test Data Summary for Residential Sprinklers Discharging Antifreeze Mixtures* dated May 26, 2010
Agenda Item:  TIA 13-2010
Document:  NFPA 13, Standard for the Installation of Sprinkler Systems
Reference:  7.6.1
(TIA Log 998)

Comment Closing:  7/23/2010
0 Public Comments Received

TIA TCC BALLOT RESULTS PENDING
(Ballot results may change due to public comment circulation, if any)

According to 5.4 in the NFPA (RGCP), the final results show this TIA HAS/HAS NOT achieved the necessary votes on both Question 1 (Correlation Issues) and Question 2 (Emergency Nature).

The number of affirmative votes needed to obtain a recommendation to issue the TIA is ____.

[___ (eligible to vote) – ___ (not returned) – ___ (abstentions) = ___ \times 0.75 = ___]

In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required.

[___ eligible ÷ 2 = ___ + 1 = ___ (this is the simple majority)]

0 Eligible to Vote
0 Not Returned

TCC PENDING Ballot results for Correlation Issues are as follows:
0 Affirmative
0 Negative
0 Abstentions

Final Action: PASS/FAIL

TCC PENDING Ballot results for Emergency Nature are as follows:
0 Affirmative
0 Disagreement
0 Abstentions

Final Action: PASS/FAIL

TIA PRELIMINARY AUT-SSI TC BALLOT RESULTS
(Ballot results may change due to public comment circulation, if any)

According to 5.4 in the NFPA (RGCP), the final results show this TIA HAS achieved the necessary votes on both Question 1 (Technical Merit) and on Question 2 (Emergency Nature).

The number of affirmative votes needed to obtain a recommendation to issue the TIA is 21.

[30 (eligible to vote) – 1 (not returned) – 1 (abstention) = 28 \times 0.75 = 21]

In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required.

[30 eligible ÷ 2 = 15 + 1 = 16 (this is the simple majority)]

30 Eligible to Vote
1 Not Returned (Noble)

TC FINAL Ballot results for Technical Merit are as follows:
22 Affirmative (Fuller, Keeping, Laverick, Miller w/comment)
6 Negative (Bahadori, Caputo, Hilton, Ketner, Meehan, Underwood)
1 Abstention (Tomlin)

Final Action: PASSED

TC Final Results continued on next page
TC FINAL Ballot results for *Emergency Nature* are as follows:

- 25 Affirmative (Caputo, Keeping w/comment)
- 3 Disagreement (Joyce, Patel, Underwood)
- 1 Abstention (Tomlin)

**Final Action:** PASSED
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the
2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:


AFFIRMATIVE  X  NEGATIVE  ABSTAIN

EXPLANATION OF VOTE - Please type or print your comments:

An explanation must accompany a negative or abstaining position.

Further research and study is needed. I am also not sure why this is only addressing the inside of dwelling units. I have the same concern for sprinklers outside of the dwelling unit.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

X AGREEMENT  DISAGREEMENT  ABSTAIN

EXPLANATION OF VOTE - Please type or print your comments:

An explanation must accompany a disagreement or abstaining position.


Signature:
Hamid Bahadori

Name (Please Print)
7-4-10

Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169  FAX: (617) 984-7110  E-mail: jmoreau@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

AFFIRMATIVE  X  NEGATIVE*  ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

I AM VOTING NEGATIVE BECAUSE I FAVOR A MORATORIUM ON THE
USE OF ALL ANTIFREEZE SOLUTIONS PENDING FURTHER STUDY.
NFPA 13 REQUIREMENTS SHOULD BE CONSISTENT WITH 130-1-13F ON
THE USE OF AXE SOLUTIONS.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

X AGREEMENT  DISAGREEMENT*  ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

I AGREE THIS MATTER REQUIRES IMMEDIATE ATTENTION AND
ACTION BY THE T.C. (I DON'T AGREE THIS PROPOSAL IS THAT
ACTION)

Signature

Robert G. Caputo

Name (Please Print)

July 1, 2010

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110

E-mail: jmoreau@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the
2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

[ ] AFFIRMATIVE [X] NEGATIVE* [ ] ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

The acceptability of 50% solutions should be verified by actual testing with valve for
packages.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

[ ] AGREEMENT [X] DISAGREEMENT* [ ] ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

______________________________
Signature

______________________________
Name (Please Print)

______________________________
Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110
E-mail: jmoreaucorreia@nfpa.org
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PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the
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Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

☒ AFFIRMATIVE ☐ NEGATIVE* ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

☐ AGREEMENT ☒ DISAGREEMENT* ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

Since we are going back into cycle in October I can not see the need at the moment for action, if an immediate problem does not exist.

Signature: 
Elaine G. Joyce

Name (Please Print): 
28 June 2010
Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110
E-mail: jmoreaucorrceia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the
2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems.

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

☐ AFFIRMATIVE  ☑ NEGATIVE*  ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

__________________________

__________________________

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

☑ AGREEMENT  ☐ DISAGREEMENT*  ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

__________________________

__________________________

Signature

CHARLES NETTEN

Name (Please Print)

7-2-10

Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110  E-mail: jmoreaucorreia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998

Adding 7.6.1 and renumber accordingly to the
2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

_________ AFFIRMATIVE  X _______ NEGATIVE*  _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

The two alleged Flash Fire incidents and the recent VL test results have created an atmosphere where any use of glycerin or P.A. will be challenged on both engineering and ethical levels.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

_________ X AGREEMENT  _______ DISAGREEMENT*  _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

_________

Signature
Michael F. Meehan

Name (Please Print)
July 6, 2010

Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

Fax: (617) 984-7110  E-mail: jmoreaucorreia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998

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2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

[ ] AFFIRMATIVE  [ ] NEGATIVE*  [ ] ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

[ ] AGREEMENT  [ ] DISAGREEMENT*  [ ] ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

1. More testing should be conducted considering parameters such as room ventilation, ceiling height, industrial and business occupancies, etc.
2. Only two fire scenarios do not make this situation of an 'Emergency Nature'.

Signature

JANAK B. PATEL

Name (Please Print)

6/29/2010

Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:

Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110

E-mail: jmoreaucorreia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the
2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

_____ AFFIRMATIVE   X   NEGATIVE*   _____ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

Revision is too restrictive. All testing was done using
Residential sprinklers.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

_____ AGREEMENT   X   DISAGREEMENT*   _____ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

Too knee-jerk reaction. More testing needs to be
done.

__________________________
Signature
LYNN K. LINDENMOORE

Name (Please Print)
7/3/10

Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169  FAX: (617) 984-7110  E-mail: jmoreau.correia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the
2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

X AFFIRMATIVE  ________ NEGATIVE*  ________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

Until further testing can be conducted, a moratorium on the use of combustible antifreeze solutions would be preferable, however limiting to 50% or less is better than what is currently in the standard.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

X AGREEMENT  ________ DISAGREEMENT*  ________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

________________________________________________________
Signature
David B. Fuller
Name (Please Print)
July 6, 2010
Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110
E-mail: jmoreaucorreia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 598
Adding 7.6.1 and renumber accordingly to the
2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

✓ AFFIRMATIVE _______ NEGATIVE* _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

SEE ATTACHED SHEET

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

✓ AGREEMENT _______ DISAGREEMENT* _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

SEE ATTACHED SHEET

Signature LARRY KEEPING
Name (Please Print) LARRY KEEPING
Date 6 July 2010

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110
E-mail: jmoreaucorreia@nfpa.org
NFPA 13  
Ballot for TC on Sprinkler System Installation Criteria  
Proposed Tentative Interim Amendment Log No. 998

Regarding this issue, I vote Affirmative for TIA 998.

Comment on Affirmative Vote:

Based on my reading of the information package that came as part of the Ballot materials, it appears that 50% / 50% antifreeze solutions perform almost as well as water does, so I believe that this mixture will give us a viable mechanism to sprinkler dwelling units in freezing environments without undue risk.

However, just as air bags aren't the ideal solution for all possible automobile collision scenarios, the 50% / 50% arrangement isn't all we could wish for, and I see this TIA as only a temporary measure to buy us some time, to allow us to delve further into the question, while still being able to protect lives and property to a reasonable degree.

I do not support the corresponding proposal to ban A/F from dwelling units, because there are scenarios where water based wet systems aren't practical due to the freezing concerns and dry systems aren't practical due to the 15 second water delivery time criteria, so the only available option would be to use an A/F type system.

Regarding this issue, I Agree that this issue is of an Emergency Nature.

Comment on Agreement:

The reported fire incidents and the recent UL testing certainly points to a dire potential hazard with A/F systems with higher concentrations, and we cannot in good conscience maintain the status quo.

Larry Keeping, P.Eng  
Vipond Fire Protection
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the

2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

   ______ X ______ AFFIRMATIVE _______ NEGATIVE* _________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a negative or abstaining position.

We are voting affirmatively on TIA 998 for the sole reason that immediate action needs to be taken to eliminate reference to antifreeze concentrations that have demonstrated the potential to ignite and create a large-scale spray type fire. However, there is an urgent need to conduct further research to address knowledge gaps and obtain a more comprehensive understanding of the performance of residential sprinklers discharging antifreeze mixtures including those that contain concentrations of 50% or less.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

   ______ X ______ AGREEMENT ________ DISAGREEMENT* _________

ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a disagreement or abstaining position.

George E. Laverick
Name

July 1, 2010
Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the
2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

☐ AFFIRMATIVE  ☐ NEGATIVE*  ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

________________________________________________________________________

________________________________________________________________________

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

☐ AGREEMENT  ☐ DISAGREEMENT*  ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

________________________________________________________________________

________________________________________________________________________

[Signature]
Thomas H. Miller, PE
Name (Please Print)
July 9, 2010
Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110  E-mail: jmoreaucorreia@nfpa.org
July 9, 2010

NFPA Standard No. 13
Proposed Tentative Interim Amendment Log No. 998

Comments on Affirmative Vote:

In addition to the proposed text in the body of the standard, the following Appendix Note should be added:

In recent fire testing and two fire reports involving some fuels, there have been conditions where antifreeze solutions containing less than 50% water have resulted in the development of unacceptable heat release rates prior to the arrival of water discharge. The conditions leading to such fires involved small discharge coefficient sprinklers, such as those used in residential occupancies, and discharge pressures which favored the development of small droplets. If possible, antifreeze solutions in systems using residential sprinklers should be avoided at this time.

The material provided the Committee does not contain sufficient engineering and scientific data to support additional action. In addition, the comments of Larry Keeping, P.Eng. are important in deciding the appropriate action for this TIA. The NFPA Research Foundation Report contains some fundamental errors and confusion that need to be addressed.

Respectfully submitted,

[Signature]

Thomas H. Miller, PE
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the
2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

_________ AFFIRMATIVE ________ NEGATIVE*   __/____ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

Supporting documentation states 2 example cases,
First case is improper design. Second case is with 50% concentration.
This does not provide adequate documentation.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

_________ AGREEMENT ________ DISAGREEMENT*   __/____ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

This issue should be dealt with through the regular TIA process.

________________________
Signature

________________________
Name (Please Print)

________________________
Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110   E-mail: jmoreau.correia@nfpa.org
TIA TCC FINAL BALLOT RESULTS (as of 7/23/10)
(Ballot results may change due to public comment circulation)

According to 5.4 in the NFPA (RGCP), the final results show this TIA **HAS NOT** achieved the necessary votes on Question 1 (Correlation Issues) and **HAS** on Question 2 (Emergency Nature).

The number of affirmative votes needed to obtain a recommendation to issue the TIA is **14**.

\[
20 \text{ (eligible to vote)} - 2 \text{ (not returned)} - 0 \text{ (abstentions)} = 18 \times 0.75 = 13.5
\]

In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required.

\[
20 \text{ eligible} ÷ 2 = 10 + 1 = 11 \text{ (this is the simple majority)}
\]

<table>
<thead>
<tr>
<th>Eligible to Vote</th>
<th>Not Returned (Ketner, Stultz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>2</td>
</tr>
</tbody>
</table>

TCC FINAL Ballot results for **Correlation Issues** are as follows:

<table>
<thead>
<tr>
<th>Affirmative</th>
<th>Negative (Budnick, Fuller, Huggins, Javeri, Leavitt)</th>
<th>Abstentions</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

**Final Action: FAIL**

The number of affirmative votes needed to obtain a recommendation to issue the TIA is **13**.

\[
20 \text{ (eligible to vote)} - 2 \text{ (not returned)} - 1 \text{ (abstention)} = 17 \times 0.75 = 12.75
\]

In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required.

\[
20 \text{ eligible} ÷ 2 = 10 + 1 = 11 \text{ (this is the simple majority)}
\]

TCC FINAL Ballot results for **Emergency Nature** are as follows:

<table>
<thead>
<tr>
<th>Affirmative (Bell, Javeri w/comment)</th>
<th>Disagreement</th>
<th>Abstention (Underwood)</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

**Final Action: PASS**

**TC Final Results continued on next page**
According to 5.4 in the NFPA (RGCP), the final results show this TIA has achieved the necessary votes on both Question 1 (Technical Merit) and on Question 2 (Emergency Nature).

The number of affirmative votes needed to obtain a recommendation to issue the TIA is 21.

\[ 30 \text{ (eligible to vote)} - 1 \text{ (not returned)} - 1 \text{ (abstention)} = 28 \times 0.75 = 21 \]

In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required.

\[ 30 \text{ eligible} ÷ 2 = 15 + 1 = 16 \text{ (this is the simple majority)} \]

<table>
<thead>
<tr>
<th>Eligible to Vote</th>
<th>Not Returned (Noble)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>14</td>
</tr>
</tbody>
</table>

TC FINAL Ballot results for Technical Merit are as follows:
22 Affirmative (Fuller, Keeping, Laverick, Miller w/comment)
6 Negative (Bahadori, Caputo, Hilton, Ketner, Meehan, Underwood)
1 Abstention (Tomlin)

Final Action: PASS

TC FINAL Ballot results for Emergency Nature are as follows:
25 Affirmative (Caputo, Keeping w/comment)
3 Disagreement (Joyce, Patel, Underwood)
1 Abstention (Tomlin)

Final Action: PASS
TECHNICAL CORRELATING COMMITTEE

LETTER BALLOT

PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998

Adding 7.6.1 and renumber accordingly to the 2010 Editions of NFPA 13,

Standard for the Installation of Sprinkler Systems

Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA Regs.

☑ AGREE ☑ DISAGREE* ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant section(s)/paragraph(s) of the correlation issue and describe.

Action taken by SSE on Proposed TIA 998 is in direct conflict with action taken by RSS on Proposed TIA's 994/997.

Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

☑ AGREE ☑ DISAGREE* ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.

__________________________________________________________

Signature

Edward K. Bouchard  

Name (Please Print)

2/14/10  

Date

Please return the ballot on or before Friday, July 16, 2010

PLEASE RETURN TO:

Jeanne Moreau

NFPA

1 Batterymarch Park

Quincy, MA 02169  

FAX: (617) 984-7110  

E-mail: jmoreau@nfpa.org

Standards Council Supplemental Agenda  

August 3-5, 2010  

Page 1250 of 1603

Revised Page Number 482 of 837
TECHNICAL CORRELATING COMMITTEE
LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the 2010 Editions of NFPA 13,
Standard for the Installation of Sprinkler Systems

☑ Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA Regs.

☐ AGREE ☑ DISAGREE* ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant section(s)/paragraph(s) of the correlation issue and describe.

Log 998 is in conflict with 994 & 995.

☐ standard.

☑ Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

 ☐ AGREE ☑ DISAGREE* ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.

☐

Signature

David B. Fuller

Name (Please Print)
July 16, 2010

Date

Please return the ballot on or before Friday, July 16, 2010

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110
E-mail: jmoreaucorreia@nfpa.org
TECHNICAL CORRELATING COMMITTEE
LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 999
Adding 7.6.1 and renumber accordingly to the 2010 Editions of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: I agree there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA Regs.

✓ AGREE  X DISAGREE*  ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant section(s)/paragraph(s) of the correlation issue and describe.

NEEDS TO CORRELATE WITH ACTION ON TIA 996 (13D) AND TIA 997 (13R)

Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

✓  AGREE  DISAGREE*  ABSTAIN

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.

______________________________

Signature
R. H. L. C.

Name (Please Print)

Date
7/14/10

Please return the ballot on or before Friday, July 16, 2010

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110  E-mail: jmoreau@nfpa.org

Standards Council Supplemental Agenda  August 3-5, 2010  Page 1252 of 1603

Revised Page Number 484 of 837
TECHNICAL CORRELATING COMMITTEE
LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the 2010 Editions of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPARegs.

✓ AGREE       ☐ DISAGREE*       ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant section(s)/paragraph(s) of the correlation issue and describe.

This needs correlation with TIA 994 ≤ 995. This TIA allows Antifreeze in dwelling units protected with a 13 system. There is no difference in a dwelling unit in 13D or 13R and 13!!

Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

✓ AGREE       ☐ DISAGREE*       ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.

This is of Emergency Nature but the wording should be as the TIA for 13D & 13R.

Signature: [Signature]
Name (Please Print): S. Javeri
Date: 6/7/10

Please return the ballot on or before Friday, July 16, 2010

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110
E-mail: jmoreaucorreia@nfpa.org
TECHNICAL CORRELATING COMMITTEE
LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber according to the 2010 Editions of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA Regs.

☑ AGREE ☒ DISAGREE* ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant section(s)/paragraph(s) of the correlation issue and describe.

SEE ATTACHED

☑ Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

☐ AGREE ☒ DISAGREE* ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.

Signed: RUSSELL LEAVITT
Name (Please Print) 16 JUL 2010

Date

Please return the ballot on or before Friday, July 16, 2010

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110 E-mail: jmoreaucorreia@nfpa.org

Standards Council Supplemental Agenda August 3-5, 2010 Page 1254 of 1603

Revised Page Number 486 of 837
These proposals are related and cannot be incorporated independent of each other. Regardless of the final action on each, the requirement(s) regarding the use of antifreeze for residential occupancies must be correlated between NFPA 13, 13R, and 130. At this time it appears that Log 398 is the only proposal of the 6 related to this issue that has received the required votes to pass ballot for both technical merit and emergency nature. Log 993 for NFPA 13 cannot be instituted without a consensus on the issue between the three installation standards. In addition, we must not forget that the maintenance requirements found in NFPA 25 related to antifreeze systems must be addressed if any changes to 13 and 13R are approved.
TECHNICAL CORRELATING COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998

Adding 7.6.1 and renumber accordingly to the 2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems.

Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA Regs.

✓     X     AGREE    DISAGREE*    ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany any disagreement or abstaining position. If disagreeing, cite relevant section(s)/paragraph(s) of the correlation issue and describe.

From a correlation standpoint, we believe the restrictions regarding the use of antifreeze in dwelling units should be the same for NFPA 13D, NFPA 13R and 13 based upon information currently available.

Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

✓     X     AGREE    DISAGREE*    ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany any disagreement or abstaining position.

Immediate action needs to be taken to eliminate reference to antifreeze concentrations that have demonstrated the potential to ignite and create a large-scale spray type fire.

[Signature]

Kerry M. Bell            Name (Please Print)

7/14/10                  Date

Please return the ballot on or before **Friday, July 16, 2010**

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169  FAX: (617) 984-7110  E-mail: jmoreaucorreia@nfpa.org
TECHNICAL CORRELATING COMMITTEE
EXTERIOR BID
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 299
Adding 7.6.1 and number accordingly to the 2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA Draft

☐ ☑ AGREE ☐ DISAGREE* ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant section(s), paragraph(s) of the correlation issue and describe:

As long as 7.6.1, 9.7.4 and 9.7.5 are not adopted and as sections 7.6.1, 9.7.4 and 9.7.5 are adopted, there are no correlation issues.

Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE

☐ ☑ AGREE ☐ DISAGREE* ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.

____________________
Signature

____________________
Name (Please Print)

____________________
Date

Please return the ballot on or before Friday, July 16, 2010

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110
E-mail: Jmoreau@nfpa.org
TECHNICAL CORRELATING COMMITTEE
LETTER BALLOT

PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the 2010 Editions of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA Regs.

X AGREE ___________ DISAGREE* ___________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant section(s)/paragraph(s) of the correlation issue and describe.

MORE RESEARCH IS NEEDED TO ESTABLISH IF FURTHER RESTRICTIONS
ON THE USE OF ANTIFREEZE SYSTEMS ARE REQUIRED.

Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

X AGREE ___________ DISAGREE* ___________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.

_________________________________________________________________________

Signature: DONATO PIERRO

Name (Please Print): JULY 21, 2010

Date

Please return the ballot on or before Friday, July 16, 2010

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110

E-mail: jmoreaurreia@nfpa.org
TECHNICAL CORRELATING COMMITTEE
LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 999
Adding 7.6.1 and renumber accordingly to the 2010 Editions of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy
enclosed) of the NFPA Regs.

☑ AGREE ☐ DISAGREE* ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant
section(s)/paragraph(s) of the correlation issue and describe.

☑ AGREE ☐ DISAGREE* ☑ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a negative/disagreement or abstaining position.

Proposed TIA does not consider sprinklers other than
Residential sprinklers used in dwelling units. Something
needs to be done to correct the anti-freeze issue. But we
shouldn’t go beyond the test data provided

[Signature]
[Name (Please Print)]
[Date]

Please return the ballot on or before Friday, July 16, 2010

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110
E-mail: jmoreaucorrea@nfpa.org

Standards Council Supplemental Agenda
August 3-5, 2010
Page 1259 of 1603
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the
2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

________ AFFIRMATIVE  __________ NEGATIVE*  ________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

Further research and study is needed. I am also not sure why this is only
addressing the inside of dwelling units. I have the same concern for sprinklers
outside of the dwelling unit.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

________ AGREEMENT  __________ DISAGREEMENT*  ________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.


Signature:
Hamid Bahadori

Name (Please Print)
7-4-10

Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:  
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169   FAX: (617) 984-7110  
E-mail: jmoreau@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the
2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

**AFFIRMATIVE**    **X** **NEGATIVE**    **ABSTAIN**

**EXPLANATION OF VOTE** - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

**I AM VOTING NEGATIVE BECAUSE I FAVOR A MORATORIUM ON THE USE OF ALL ANTIFREEZE SOLUTIONS PENDING FURTHER STUDY. NFPA 13 REQUIREMENTS SHOULD BE CONSIDERED WITH RESPECT TO THE USE OF ANF SOLUTIONS.**

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

**X** **AGREEMENT**    **DISAGREEMENT**    **ABSTAIN**

**EXPLANATION OF VOTE** - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

**I AGREE THIS MATTER REQUIRES IMMEDIATE ATTENTION AND ACTION BY THE T.C. (I DON'T AGREE THIS PROPOSAL IS THAT ACTION)**

Signature: **Robert G. Caputo**

Name (Please Print): **July 1, 2010**

Please return the ballot on or before Tuesday, July 6, 2010.

**PLEASE RETURN TO:**
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

**FAX:** (617) 984-7110  **E-mail:** moreau@morsess@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the
2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

________ AFFIRMATIVE    X    NEGATIVE*     _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

The acceptability of 50% solutions should be
verified by pool testing with named<br />
packages.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

X AGREEMENT      __________ DISAGREEMENT*     _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

__________________________
Signature

__________________________
Name (Please Print)

__________________________
Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110

E-mail: jmoreau.correia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the
2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

X AFFIRMATIVE _________ NEGATIVE* _________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

Agreement     X DISAGREEMENT* _________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

Since we are going back into cycle in October I can not see the need at the moment for action if an immediate problem does not exist.

Signature:

Elwin G. Joyce

Name (Please Print):

28 June 2010

Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110       E-mail: jmoreaucorrecia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the
2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

__ AFFIRMATIVE  X NEGATIVE*  __ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.


Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

X AGREEMENT  __ DISAGREEMENT*  __ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.


Signature
CHARLES NETZER
Name (Please Print)
7-2-10
Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110
E-mail: jmoreaucorreia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the
2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

_____ AFFIRMATIVE  X  NEGATIVE*  _____ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

The two alleged Flash Fire incidents and the recent UL test results have created an atmosphere where any use of glycerin or PG, will be challenged on both engineering and ethical levels.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

X  AGREEMENT  _____ DISAGREEMENT*  _____ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

______________________________

Signature
Michael F. Meehan

Name (Please Print)
July 6, 2010

Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169  FAX: (617) 984-7110  E-mail: jmoreaucorreia@nfpa.org

Standards Council Supplemental Agenda, August 3-5, 2010, Page 1265 of 1603
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the
2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

☑️ AFFIRMATIVE    ☐️ NEGATIVE*    ☐️ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

☐️ AGREEMENT    ☑️ DISAGREEMENT*    ☐️ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

1. More testing should be conducted considering parameters such as room ventilation, ceiling height, industrial and business occupancies, etc.

2. Only two nozzles do not make this situation of an 'Emergency Nature'.

Signature
JANAK B. PATEL

Name (Please Print) 6/29/2010

Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110

E-mail: jmoreaucorreia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the
2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

_________ AFFIRMATIVE _______ NEGATIVE* _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

Revision is too restrictive. All testing was done using
Residential Sprinklers.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

_________ AGREEMENT _______ DISAGREEMENT* _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

Too knee-jerk reaction. More testing needs to be done

Signature
LYNN K. LANDERWOOD
Name (Please Print)
7/19/10
Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110 E-mail: jmoreau.correa@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the
2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

X AFFIRMATIVE   ________ NEGATIVE*   ________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

Until further testing can be conducted, a moratorium on the use of combustible antifreeze solutions would be preferable, however limiting to 50% or less is better than what is currently in the standard.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

X AGREEMENT   ________ DISAGREEMENT*   ________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

________________________________________
Signature

David B. Fuller

Name (Please Print)

July 6, 2010

Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110   E-mail: jmoreaucorrea@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the
2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

☐ AFFIRMATIVE ☐ NEGATIVE* ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a negative or abstaining position.

SEE ATTACHED SHEET

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

☐ AGREEMENT ☐ DISAGREEMENT* ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a disagreement or abstaining position.

SEE ATTACHED SHEET

Signature LARRY KEEPING
Name (Please Print) 6 July 2010
Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110
E-mail: jmoreaucorrea@nfpa.org
NFPA 13
Ballot for TC on Sprinkler System Installation Criteria
Proposed Tentative Interim Amendment Log No. 998

Regarding this issue, I vote Affirmative for TIA 998.

Comment on Affirmative Vote:

Based on my reading of the information package that came as part of the Ballot materials, it appears that 50% / 50% antifreeze solutions perform almost as well as water does, so I believe that this mixture will give us a viable mechanism to sprinkler dwelling units in freezing environments without undue risk.

However, just as air bags aren't the ideal solution for all possible automobile collision scenarios, the 50% / 50% arrangement isn't all we could wish for, and I see this TIA as only a temporary measure to buy us some time, to allow us to delve further into the question, while still being able to protect lives and property to a reasonable degree.

I do not support the corresponding proposal to ban A/F from dwelling units, because there are scenarios where water based wet systems aren't practical due to the freezing concerns and dry systems aren't practical due to the 15 second water delivery time criteria, so the only available option would be to use an A/F type system.

Regarding this issue, I Agree that this issue is of an Emergency Nature.

Comment on Agreement:

The reported fire incidents and the recent UL testing certainly points to a dire potential hazard with A/F systems with higher concentrations, and we cannot in good conscience maintain the status quo.

Larry Keeping, P.Eng
Vipond Fire Protection
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the

2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

_____ X _____ AFFIRMATIVE _______ NEGATIVE* _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a negative or abstaining position.

We are voting affirmatively on TIA 998 for the sole reason that immediate action needs to be taken to eliminate reference to antifreeze concentrations that have demonstrated the potential to ignite and create a large-scale spray type fire. However, there is an urgent need to conduct further research to address knowledge gaps and obtain a more comprehensive understanding of the performance of residential sprinklers discharging antifreeze mixtures including those that contain concentrations of 50% or less.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

_____ X _____ AGREEMENT _______ DISAGREEMENT* _______

ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a disagreement or abstaining position.

George E. Laverick
Signature

George E. Laverick
Name

July 1, 2010
Date

Please return the ballot on or before Tuesday, July 6, 2010.
PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998
Adding 7.6.1 and renumber accordingly to the
2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

X AFFIRMATIVE  _______ NEGATIVE*  _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

See attached page

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

X AGREEMENT  _______ DISAGREEMENT*  _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

________________________________________________________

Signature
Thomas H. Miller

Name (Please Print)
Thomas H. Miller, PE

Date
July 9, 2010

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110

E-mail: jmoreaucorreia@nfpa.org
July 9, 2010

NFPA Standard No. 13
Proposed Tentative Interim Amendment Log No. 998

Comments on Affirmative Vote:

In addition to the proposed text in the body of the standard, the following Appendix Note should be added:

In recent fire testing and two fire reports involving some fuels, there have been conditions where antifreeze solutions containing less than 50% water have resulted in the development of unacceptable heat release rates prior to the arrival of water discharge. The conditions leading to such fires involved small discharge coefficient sprinklers, such as those used in residential occupancies, and discharge pressures which favored the development of small droplets. If possible, antifreeze solutions in systems using residential sprinklers should be avoided at this time.

The material provided the Committee does not contain sufficient engineering and scientific data to support additional action. In addition, the comments of Larry Keeping, P.Eng. are important in deciding the appropriate action for this TIA. The NFPA Research Foundation Report contains some fundamental errors and confusion that need to be addressed.

Respectfully submitted,

Thomas H. Miller, PE
TECHNICAL COMMITTEE LETTER BALLOT  
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 998  
Adding 7.6.1 and renumber accordingly to the  
2010 Edition of NFPA 13,  
Standard for the Installation of Sprinkler Systems

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

[ ] AFFIRMATIVE  [ ] NEGATIVE*  [x] ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

[Supporting documentation states 2 example cases.  
First case is improper design, second case is with 50% concentration.  
This does not provide adequate documentation.]

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

[ ] AGREEMENT  [ ] DISAGREEMENT*  [x] ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

[This issue should be dealt with through the regular TIA process.]

[Signature]  
[Name (Please Print)]  
[Date]

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau  
NFPA  
1 Batterymarch Park  
Quincy, MA 02169  
FAX: (617) 984-7110  
E-mail: jmoreau.corcia@nfpa.org
Subject: FW: [CM] RE: Revised July 2010 NFPA News
Importance: High

From: srinivasan sridhar [mailto:srinivasan_sridh@hotmail.com]
Sent: Thursday, July 08, 2010 8:33 PM
To: Customer service
Cc: Support
Subject: [CM] RE: Revised July 2010 NFPA News
 Importance: High

Dear NFPA Team,

My comments are given hereunder

1. David Hague's 'TIA Log No 1000 for 7.6.1.Dwelling units' is acceptable; my additional comments are 'keep dry pipe sprinklers for dwelling units till such time alternative safe antifreeze solutions are ready in hand'.

2. For Ken Isman's TIA 997 & 998 NOT agreeable to the use of ANTIFREEZE; a dry sprinkler with air / nitrogen filled one is welcome.

Best regards
srinivasa sridhar CEng CEnv MBA

HSO
FERTIL
ABUDHABI
UAE.
s.srinivasa@fertil.com

Date: Wed, 30 Jun 2010 14:10:14 +0000
From: nfpa@e.nfpa.org
To: srinivasan_sridh@hotmail.com
Subject: Revised July 2010 NFPA News

---

**NFPA NEWS**

Providing NFPA Members up-to-date information on NFPA codes and standard activities

Read the Revised July 2010 issue of **NFPA News**

**In this issue:**

- **Comments Sought for Proposed TIA to NFPA 13, NFPA 13D and NFPA 13R. Three additional TIA's have been added since last July notification.**
July 20, 2010

Secretary
Standards Council
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471

RE: TIA 994, TIA 995, TIA 996, TIA 997, TIA 998, and TIA 1000

Dear Sir:

On July 13, 2010, the Utah Fire Prevention Board met in a regularly scheduled Board meeting to address a number of fire prevention concerns in the State of Utah. One of those items of discussion was the Safety Alert issued by the National Fire Protection Association (NFPA) with regard to the use of antifreeze in automatic fire sprinkler systems in a residential setting.

The Utah Fire Prevention Board is the overseeing authority for fire prevention in the State of Utah. The Board members are appointed by the Governor of the State of Utah and consists of ten members from various disciplines. The Board has statutory authority over the Office of the State Fire Marshal, oversight of the fire code which is adopted statewide by the Utah State Legislature, firefighter training, certification and licensing of several different fire oriented disciplines, fireworks, fire incident reporting, etc. The Utah Fire Prevention Board has been in existence with that statutory authority since it’s inception in 1964.

The Board’s discussion and comments received were in response to the Safety Alert issued by NFPA that directed that all residential fire sprinkler systems that use antifreeze, have the antifreeze drained and refilled with water. The Board also discussed the several proposed TIAs that would affect the continued use of antifreeze in the State of Utah in residences. The Board also discussed the study conducted by The Fire Protection Research Foundation on the use of antifreeze in a residential setting, and the many places throughout that document requesting that further research or further study needs to be completed to bring this concern to a complete understanding.

The Board felt that this is a very complex and diverse concern for there are large numbers of these types of systems in the State of Utah alone. The Board wanted to convey to those at the National Fire Protection Association that the initial interim direction by NFPA to drain the antifreeze out and refill with water simply will not work in the State of Utah. There would be hundreds of thousands of dollars of water damage from broken pipes that would freeze in the first winter season. In the higher elevations in the State of Utah, winter begins in approximately eight weeks. In the coldest portion of winter, all of the State of Utah will be subject to freezing winter temperatures, and some areas will be near or below 0 degrees Fahrenheit and stay there for an extended period of time. With current designs and piping layout, it is impossible to insulate and expect the systems to not freeze and break.

The Utah Fire Prevention Board strongly urges NFPA that before there are directions given from the largest fire prevention organization in the world, that all the technical data needs to be collected and fully analyzed for validity. The Board understands that there could be a problem with the usage of antifreeze in a residential setting that will need some correction. The Board feels though, that the direction given from NFPA to drain the antifreeze and refill with water will cause a much greater problem than leaving the antifreeze in it’s current form.
The Board asks that the current Technical Interim Amendments, TIA 994, 995, 996, 997, 998, and 1000 either be denied or placed on hold till all data can be fully studied. Just draining out the antifreeze and replacing it with water creates a far bigger problem than it corrects. Direction from NFPA for occupants in residences using antifreeze to immediately leave the residence in the event of fire, has a much more practical and attainable application than just draining the system.

Antifreeze systems have been in use in this country since the 1940s, and their usage is now so interwoven throughout our fire protection systems, that temporary and costly interim direction from NFPA will due more long term damage than leaving the systems intact as they currently exist until all research has been completed and analyzed. The perception of the citizens we serve is paramount to the success of any effort in preventing loss of life and property from the ravages of fire. Hasty response or incomplete solutions will quickly erode the confidence of our citizens that has taken years for the fire service to attain in the State of Utah.

The full interest of the Utah Fire Prevention Board is the betterment of the citizens of the State of Utah with regard to fire and life safety. We as the Fire Prevention Board for the State of Utah, respectfully submit this to you as Secretary of the Standards Council for their review.

Sincerely,

Ted Black, Chairman
Utah Fire Prevention Board

cc: Fire Prevention Board members
    Ron L. Morris
    State Fire Marshal
    Utah State Fire Chiefs Association
    Fire Marshal’s Association of Utah
    Raymond B. Bizal
    NFPA
    Lana Taylor
    Assistant Attorney General
FORM FOR COMMENT ON NFPA REPORTS AND STANDARDS
All Comments Must Be Received by 5:00 pm EST/EDT
on the Published Comment Closing Date

Please indicate in which format you wish to receive your ROP/ROC [ ] electronic [ ] paper [ ] download
(Note: If choosing the download option, you must view the ROP/ROC from our website; no copy will be sent to you.)

Date: 7/21/2010  Name: Jason S. Haire  Tel. No. 303-425-0698
Company: Code Fire, LLC  Email: jhaire@codefirellc.com
Street Address: 4896 Van Gordon Street  City: Wheat Ridge  State: CO  Zip: 80022

***If you wish to receive a hard copy, a street address MUST be provided. Deliveries cannot be made to PO boxes.

Please indicate organization represented (if any)

1. (a) NFPA Document Title: Standard for the Installation of Sprinkler Systems  NFPA No. & Year: 13, 2010
(b) Section/Paragraph: 7.6.1.1

2. Comment on Proposal No. (from ROP): TIA No. 998

3. Comment Recommends (check one):  [ ] new text  [X] revised text  [ ] deleted text

4. Comment (include proposed new or revised wording, or identification of wording to be deleted): [Note: Proposed text should be in legislative format; i.e., use underscore to denote wording to be inserted (inserted wording) and strike-through to denote wording to be deleted (deleted wording).]

7.6.1.1 Only factory-premixed solutions shall be permitted. The concentration of antifreeze solutions shall be tested under the provisions of 7.6.2.5 to demonstrate the solutions do not exceed 50% by volume.

5. Statement of Problem and Substantiation for Comment: (Note: State the problem that would be resolved by your recommendation; give the specific reason for your Comment, including copies of tests, research papers, fire experience, etc. If more than 200 words, it may be abstracted for publication.)

2010 NFPA 13-7.6.2.5 already requires the solution be tested to determine specific gravity (and consequently solution % by volume) regardless of the solution source. The proposed requirement limiting source to Factory premixed solutions only could present an increase in cost, especially in large or multiple systems where bulk purchase of C.P. or USP grade concentrates are more economical.

6. Copyright Assignment

(a) [ ] I am the author of the text or other material (such as illustrations, graphs) proposed in the Comment.
(b) [ ] Some or all of the text or other material proposed in this Comment was not authored by me. Its source is as follows: (please identify which material and provide complete information on its source)

I hereby grant and assign to the NFPA all and full rights in copyright in this Comment and understand that I acquire no rights in any publication of NFPA in which this Comment in this or another similar or analogous form is used. Except to the extent that I do not have authority to make an assignment in materials that I have identified in (b) above, I hereby warrant that I am the author of this Comment and that I have full power and authority to enter into this assignment.

Signature (Required)

Mail to: Secretary, Standards Council - National Fire Protection Association
1 Batterymarch Park - Quincy, MA 02169-7471 OR
Fax to: (617) 770-3500 OR Email to: proposals_comments@nfpa.org

7/23/2010

Standards Council Supplemental Agenda  August 3-5, 2010  Page 1278 of 1603

Revised Page Number 510 of 837
July 23, 2010

Secretary, Standards Council
NFPA
1 Batterymarch Park
Quincy, MA
02169-7471

To Whom it May Concern,

Please accept the following comment regarding TIA 998.

TIA 998 proposes a reasonable approach to the concern regarding the use of antifreeze solutions in sprinkler systems. This approach continues the proven life safety benefit of sprinkler systems while reasonably addressing safety concerns regarding the use of antifreeze systems. The Tahoe Douglas Fire Protection District serves an area in which below freezing temperatures can be expected nine months per year. Antifreeze is the only freeze protection option for the majority of these occupancies.

The Tahoe Douglas Fire Protection District supports TIA 998, but believes that the proposed changes will take time to implement.

Please do not hesitate to call if you have any questions.

Sincerely

Mark Novak
Fire Marshal
December 3, 2009

Ray Bizal
Regional Manager
National Fire Protection Association
6285 E. Spring Street, #363
Long Beach, California 90808

SUBJECT: RESIDENTIAL FIRE (AUGUST 18, 2009) INVESTIGATION REPORT – TRUCKEE, CALIFORNIA

Dear Mr. Bizal:

The California Department of Forestry and Fire Protection (CAL FIRE) – Office of the State Fire Marshal believes the subject fire and explosion in a multi-family structure fully equipped with sprinklers may be of interest to the National Fire Protection Agency (NFPA) and its research group. According to the Truckee Fire Protection District’s investigation report (Attachment 1) the fire appears to be the result of a stove grease fire that was relocated to the kitchen sink. There was one fatality and three other occupants sustained injuries.

The Office of the State Fire Marshal was called to provide assistance to the Truckee Fire Department during the fire and explosion investigation; and also to provide technical assistance on the topic of fire sprinklers. This assistance included a supplemental report (Attachment 2); and also included are the results of a forensic laboratory test sample taken from the fire building. Both reports (Attachments 1 and 2) indicate the fire sprinkler system anti-freeze solution in the fire building cannot be excluded nor confirmed as a contributing fuel source without further testing.

Should NFPA investigate this incident, and if you wish to discuss or need additional information, please do not hesitate to contact me or you may wish to contact the Truckee Fire Protection District, Fire Chief Bryce Keller.

Sincerely,

TONYAL HOOVER
Acting State Fire Marshal

Attachments

cc: Bryce Keller, Truckee Fire Protection District
Fax

To: Tonya Hoover,  
State Fire Marshal

From: Bryce E. Keller

Fax: 1-916-445-8509  
Date: October 15, 2009

Phone: 1-916-949-3904  
Pages: 10 total, includes cover

Re: Henness Flats News release and Fire Investigation Report Attached

☐ Urgent  ☐ For Review  ☐ Please Comment  ☐ Please Reply  ☐ Please Recycle

Comments:

Tonya, Attached documents for your information.... I left you a voice message on your cell phone as well. The press conference on the 224 has been cancelled. Thank you for your continued cooperation. Please call with any questions.

Confidentiality Notice: This fax, including any attachments, is for the sole use of the recipient(s) and may contain confidential and privileged information. Any unauthorized review, use, disclosure or distribution is prohibited. If you are not the intended recipient, please contact the sender by telephone and destroy all copies of the original message.
FOR IMMEDIATE RELEASE
4 P.M. PST, October 15, 2009

FIRE AT HENNESS FLATS APARTMENT COMPLEX

TRUCKEE, CA, OCTOBER 15, 2009: On Tuesday, August 18, 2009 at approximately 3:50 P.M. there was a fire at the Henness Flats Apartment Complex, Building 6, 11907 Waters Way, Unit 101. There were 5 occupants in the unit at the time of the incident, 2 adults and 3 children.

The adults, who were in the kitchen and living room, were seriously burned, one of them fatally. The children were not burned and were transported to Tahoe Forest Hospital where they were examined and released to relatives. One of the adults was transported to UC Davis burn center in Sacramento for treatment while the second burn patient was diverted to Tahoe Forest hospital where she succumbed to her injuries.
Fire at Henness Flats Apartment Complex

The investigation has been ongoing since the incident occurred. The fire investigation report prepared by the Truckee Fire Protection District was released today, October 15, 2009. A hard copy can be obtained at the Truckee Fire District Administrative Office, 10049 Donner Pass Road, for a fee of $15.00.

Recapping the incident, a male adult was cooking with oil in the kitchen when the contents of the pan ignited. He then added water to the pan in an attempt to extinguish the fire. The high temperature of the oil caused the water to vaporize carrying the burning liquid upwards and creating a large fireball. The fireball activated the sprinkler system, which eventually extinguished the fire.

As a result of the incident, thorough reviews of all suppression and detection systems were conducted. This necessitated taking the automatic sprinkler system “Off-Line” to the buildings in the complex. The Fire District is working with the building owner to bring all systems back “On-Line” in accordance with industry standards meeting or exceeding all state and local ordinances. In the interim, the building owner has posted a fire watch 24 hours a day, seven days a week and will continue to do so until the system is back in service.

Truckee Fire Protection District strongly supports the use of residential sprinkler systems in the home. It has been proven
Fire at Henness Flats Apartment Complex

that these devices save lives and reduce the fire damage in residences while lowering insurance premiums. 90% of fires are contained with the use of one sprinkler head. Home sprinkler systems use a fraction of the water normally used by fire departments to extinguish a fire. For more information on home fire sprinkler systems go to: www.homefiresprinkler.org.

The safest method of extinguishing an oil fire in a cooking pan is to use a tight fitting lid to smother the fire. Always have a tight fitting lid available when cooking with oil. The second preferred method is to toss baking soda onto the burning contents. This will extinguish the fire. A class "B" fire extinguisher can accomplish the same thing, but you have to be careful about getting too close to the fire when using a pressurized dry chemical extinguisher. They are pressurized to around 195 pounds per square inch and can blow burning liquid out of the pan when discharged too close to the liquid. You should stand back 10-15' from the fire when attempting to use a dry chemical extinguisher and advance towards it while discharging the extinguisher. If you have any questions about kitchen fires or fire safety, contact the Truckee Fire Protection District Prevention Bureau at 530-582-7853 or visit our website at www.truckeefire.org.

-End-
SUMMARY:
A fire with explosion occurred on August 18, 2009 at approximately 1550 hours at 11907 Waters Way, Apt. 101, in Truckee. W-1 BOTTO, was nearby and hearing the incident ran to the scene. W-2 SPENCER and W-3 OSBURN were driving nearby, and hearing the incident, drove to scene. W-1 BOTTO used Hazmat-l as CP initially. Truckee Fire Protection District (TFPD), Town of Truckee Police Department (ToTPD), CALFIRE, Northstar Fire Department (NFD), North Tahoe Fire Protection District (NTFPD), Careflight (helicopter), and Calstar (helicopter) were dispatched to the scene. V-1 was rescued by W-4 BERRY. V-2/V-3 self-rescued prior to TFPD arrival, V-4 was rescued by a bystander, V-5 was rescued by W-2 SPENCER. The fire with explosion appeared to have been extinguished by the fire sprinkler system. The fire alarm was functioning in the apartment of origin and the rest of the building. V-1/V-2 were transported by M92 to a helipad nearby for transport. V-3/V-4/V-5 were transported by M51 to Tahoe Forest Hospital. V-6 was given oxygen by the CALFIRE crew, then stated, “I am okay” and left scene. TFPD and ToTPD made primary search in unit 101. There was a report of trapped occupants in the apartment above the fire. ToTPD and TFPD made forcible entry for a primary search in unit 201, no one was found. Gas and electric utilities were turned off at the West end of building. The fire sprinkler was turned off and alarm was silenced. Fire investigation activities began. TFPD and ToTPD initiated a joint investigation.

VICTIM(s) / WITNESS(es):
- V-1
  - DOB: 
- V-2
  - DOB: 
- V-3
  - DOB: 
- V-4
  - DOB: 
- V-5
  - DOB: 
- V-6
  - DOB: 

(Unknown male treated, then left scene)

Truckee Fire Protection District
Truckee Fire Protection District
Truckee Fire Protection District
Town of Truckee Police Department
EVIDENCE:
Sample of solution collected from entrance door hallway sprinkler, Apt 101. 
Backflow inspection tag removed from riser Building 6. Evidence transferred to fire investigator Russ Auker, as part of joint investigation. A set of antifreeze samples are stored in the evidence locker.

WEATHER:
Weather at the time of the fire (all are approximate): Temp. (80°F; Wind, SW (2-3) mph; Relative Humidity, (30)%; cloud cover (0)%

EQUIPMENT Apt 101:
Electric kitchen stove, gas water heater, gas forced air furnace

PROPERTY:
The Henness Flats Apartments are a low-income housing complex. The complex consists of 11 apartment buildings and 1 support structure on a multi-acre parcel. Each building is identified by a 5-digit address, with an informal 1 or 2 digit identifier used by staff and residents. The incident building’s legal address is 11097 Waters Way, Apartment 101. Further it is known as: Building 6, Apartment 101 or Apt. 6101. Building 6 is located at the southeast corner of the complex. The building is part of a complex constructed as affordable housing in 2007, owned by Truckee Pacific Associates, Nampa, Idaho; and managed by Cambridge Real Estate. Building 6, Apartment 101 is a ground floor two bedroom, one bath apartment located at the East end of the building. The building’s first floor is numbered 101 to 106 with the second floor numbered 201-206, both from east to west. Ten units were rented at the time of the incident with 103/203 being vacant. Five persons occupied Unit 101 at the time of the incident. Other units in building 6 were also occupied. The natural gas and electric shutoffs are located at the West end of the building. The property has a history of possible formaldehyde exposure to the occupants.

ESTIMATE OF LOSS: Unknown at this time.
Prefabricated modular building, Non-Custom, with possible damage to wall/floor assemblies of connected units—102 and 201.

NARRATIVE:
I responded to 11907 Waters Way upon hearing of a fire with smoke showing and injured residents. No fire was seen on arrival. Fire and law enforcement personnel were performing primary search/rescue activity. The fire sprinkler system in unit 101 was flowing water and appeared to have extinguished the fire prior to fire department arrival. Fire crews used an air monitor to check for LEL, oxygen, and carbon monoxide levels in Apt 101 and 201. No flammable/combustible levels were found. Oxygen levels were normal. Carbon monoxide levels were normal.
Windows on the south end of the apartment were broken with glass extending 80+ feet into the parking lot. The tree adjacent to the South side of the apartment had fire damage with twig "freeze" noted on tree showing the fire pushed out of the windows into the parking area. In all, six victims were identified. Five were transported and one left after receiving oxygen from CALFIRE Engine 2364. I confirmed that the gas and electric utilities were turned off to the building.

I noted minimal fire damage to unit 101 upon first inspection. The front door lockset was broken with damage to bottom of door from doorstop. The front door doorstop was broken. The sprinkler head by front door had activated and continued to drip antifreeze solution. The ceiling light fixture in the hallway in front of the water heater was deformed with heat damage. The sprinkler head had activated. The electrical panel appeared to have some of the breakers pulled from the bus bar. In the kitchen, there was a door on the floor in the hallway, appearing to be from the north bedroom. Another door was broken in half lengthwise lying on the kitchen floor, appearing to be from the bathroom. The east facing kitchen window's lower pane was broken with fire damage to the top of the bush outside. Broken glass and window curtains were scattered about outside the East side of the building. Minimal glass was seen inside on the floor. Fire damage was seen on the upper cabinets on both sides of the kitchen. The vent above the microwave was partially melted, and the light fixture lens was melted more extensively on the stove side. Soot is evident on the ceiling around the light fixture above the kitchen sink. The kitchen sprinkler head had been activated. Partially melted plastic items are on the kitchen counter between the kitchen/living-room. The refrigerator appears undamaged. The electric stove appears undamaged. A pot was located on the right front burner. W-2 SPENCER found the left front burner glowing red and turned the control off when he was performing a primary search. A skillet was found in the kitchen sink. Butter and oil were on the counter in the kitchen. Cooking activity was apparent in kitchen. The wall and ceiling paint does not appear blistered.

In the living room, the paint did not appear blistered or covered with soot. The sprinkler heads had activated. There appears to be fire damage (melting) to a chair in the middle of the room along with fire damage (melting) to the couch situated on the east wall—more damage can be seen on the left side (North) of the couch. The windows facing east are broken with glass inside and outside of frames on the ground and floor. The light fixture reflectors in the southeast corner of the room are partially melted. The windows facing south are broken out, with the window frames pushed out from the wall. Minimal glass was seen on the floor. The door on the southwest corner of the room was forced by ToTPD to rescue V-1. The door's window appeared intact. Three mirrors were sitting on the floor leaning against the west living room wall without apparent damage. There appears to be slight melting of the carpet nap.
NARRATIVE (Continued):

In the hallway the light fixtures were partially melted and the sprinkler heads activated. Doors and door trim were lying on the floor. The paint did not appear blistered. No soot was apparent on walls or ceiling.

In the south bedroom, used by V-1/V-2/V-5, the door was intact with a hole partially through the door by a piece of wood trim from the north bedroom door jam. W-2 SPENCER found V-5 on the bed in this room behind a closed door. The sprinkler head had activated above the king size bed. No heat or fire damage is apparent in the room. The paint does not appear blistered. No soot was apparent on walls or ceiling. The window is broken, with glass inside and outside the frame. The sprinkler head in the closet was intact.

The bathroom door was missing and the frame torn away from the wall towards the kitchen. The bathroom fan trim piece is pulled away from the ceiling and partially melted. The bathroom sprinkler has been activated. No blistering of paint was apparent. No soot was apparent on the walls or ceiling.

The north bedroom, used by V-3 and V-4, had the door torn from the frame and was lying on the floor between the bathroom and kitchen. The frame was almost completely torn from the wall opening. The window was broken out and the lower frame was lying on the floor. The ceiling light fixture was deformed and the sprinkler head was activated. V-4 may have been located in this room at the time of the incident. The North bedroom sprinkler head was activated. The paint does not appear blistered. No soot was apparent on walls or ceiling.

The complex’s manager notified the owner of the fire. We requested them to contact their insurance company for a fire investigator. Southwest Gas Company was notified of the incident and requested to respond.

Truckee Fire Protection District and Truckee Police Department initiated a joint investigation of the fire/explosion. The scene was inspected for evidence of a bomb or drug manufacturing paraphernalia, none was found. The gas piping in building 6 was inspected for leaks/failures, none found. The gas system or the water heater/forced air furnace appeared to function correctly. Southwest gas continued to perform system testing on the main gas line entering the complex with nothing found. The California State Fire Marshal’s Office and ATF were called for assistance. Representatives from The State Fire Marshal’s Office Sacramento, Tony Guevara, and ATF, Reno, arrived on scene 08/19/09 AM. The owner’s insurance investigator, Russ Auker, arrived on scene 08/19/09 AM. The owner called for a forensic engineer, Frank Hsu, expected arrival time of 08/19/09 late PM. Arriving personnel were briefed on what had been found and what had been done.
The joint investigation team was expanded to include representatives from: TFPD, ToIPD, ATF, State Fire Marshal, and Southwest Gas, Russ Auker, and Frank Hsu. Russ Auker called John DeHaan, Ph.D., for consultation.

The sewer system was smoke tested by Truckee Sanitary District. No infiltration was seen inside the apartments. Fire investigator Auker discussed the flammability of the anti-freeze placed in the sprinkler system. A sample from the sprinkler head in the hallway was collected and transferred to evidence collection team.

The anti-freeze was pursued as the last potential source of fuel. Numerous samples of anti-freeze were collected from several sites in Building 6 along with each building in the complex to be sent for laboratory analysis.

CONCLUSION

A stovetop fire with explosion occurred in Building 6, Apt 101. Potential ignition sources were considered to include: pilot light(s), static electricity, igniters, open-flame, and electric stove burner. Potential fuel sources included: natural gas pipe leak(s), natural gas appliance(s) leaking or malfunctioning, methane gas from the sewer system, chemical release, formaldehyde release, sprinkler system solution, and butter and/or oil.

The sprinkler system anti-freeze solution in Building 6, Apt 101 cannot be excluded or confirmed as a contributing fuel source without further testing. Both laboratory and field tests will be needed to confirm the possibility that the anti-freeze/water solution in the piping was capable of creating a combustible fuel/air mixture or of creating an explosive atmosphere that would cause the explosion that occurred.

Source of Ignition:
Electric stove top burner

Material First Ignited:
Oil and/or butter

Cause of Fire:
Oil and/or butter fire on stove.
POTENTIAL SOURCES OF IGNITION:

Smoking:
No cigarettes found in apartment

Equipment Use:
Electric stove being used by V-2 MARTINEZ at the time of the fire. Equipment potentially in use at the time of fire; gas water heater, electric cooking stove, and gas forced air furnace (thermostat turned off - gas valve on).

Children:
Of the three children home, two were old enough to be capable of playing with matches. V-3 was in kitchen and V-4 was in the North bedroom (away from origin of fire).

Miscellaneous:
No candles appeared to be in use or setting on furniture at the time of the incident.

Incendiary:
Evidence found to be consistent with accidental cause.

ATTACHMENTS:
Photo Log
Building Diagram
October 12, 2009

Mr. Clinton Carman  
Ron Hall & Associates  
Fire Consultants  
11151 Sun Center Drive, Suite A  
Rancho Cordova, CA  956670

Re: Harness Flats Apartments  
11929 Waters Way  
Truckee, CA  
Fireman's Fund: 00509547250

Submitted By: Mr. Clinton Carman  
Ron Hall & Associates  
Rancho Cordova, CA  
Submitter File: RHA # 09-279RA  
Date of Loss: 08/19/09

LABORATORY REPORT: A9GA4834-1

One sample was received on October 1, 2009 for laboratory examination. Armstrong was requested to analyze the sample for glycerol content and identification of contaminants. The sample is identified in the following table:

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<tr>
<th>Laboratory ID</th>
<th>Client ID</th>
<th>Sample Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A9-4834A-001A</td>
<td>RA #158</td>
<td>Sprinkler System Water Sample from Building #6, Unit 101-Master Bedroom Closet Collected: 8/24/09 3:10 pm</td>
</tr>
</tbody>
</table>

Methods of Analysis:
A9-4834A-001A was analyzed by Attenuated Total Reflectance - Fourier Transform Infrared Spectroscopy (ATR-FTIR), Gas Chromatography/Mass Spectrometry (GC/MS) and Ion Chromatography (IC).

Data Analysis:
A9-4834A-001A consists of 40 milliliters (mL) of a clear, colorless liquid with no odor. There is a soft yellow particulate settled in the bottom of the vial. The yellow material contains black particles that do not react to a magnet. Analysis of the yellow particulate by FTIR identified the material as polyvinyl chloride (PVC).

Analysis of the liquid portion of A9-4834A-001A identified the liquid as primarily a combination of glycerol and water. The glycerol content was determined to be 71.2%.
Analysis of A9-4834A-001A by LC established the presence of low levels of sulfate, chloride, and calcium. The liquid sample was also analyzed for volatile organic compounds by GC/MS and the analytical data establish the presence of one primary organic compound, tentatively identified as tetrahydrofuran (THF), based on the mass spectral data. Tetrahydrofuran is a common solvent used in the production of adhesives and polymers, including polyvinyl chloride. No additional compounds were detected. The analytical results are summarized in the following tables.

### Glycerol

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Results</th>
<th>Reporting Limits</th>
<th>Units</th>
<th>DF</th>
<th>Method of Analysis</th>
<th>Date of Analysis</th>
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<tr>
<td>Glycerol</td>
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<td>%</td>
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### Anions

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<td>Nitrite</td>
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<td>EPA 300</td>
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<tr>
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<td>Sulfate</td>
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### Cations

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<td>EPA 300</td>
<td>10/10/09</td>
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</tbody>
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Fire & Explosion Investigation
Report
By: Stephen Hart, Consultant

Date of Incident:
August 18, 2009 (Tuesday)
15:45 p.m. (approximate)

Location of Incident:
Henness Flats Apartments
11929 Waters Way (Building No. 6, Unit 101)
Truckee, CA

Scope/Purpose:
On August 20, 2009 Acting California State Fire Marshal Tonya Hoover/CAL-FIRE called Consultant Hart and indicated that there had been a fire and explosion in Truckee, CA and that his assistance was requested to aid ABI-Unit Investigator Tony Guevara in the investigation. According to Acting SFM Hoover the fire and explosion was in a newly constructed apartment building with a fully operational fire sprinkler system.

Note: It should also be pointed out that Consultant Hart has more than 44-plus years of experience with construction techniques, inspection practices, codes and standards, as well as fire investigation. Consultant Hart has been an Apprentice/Journeyman Electrician, Building Inspector, Building Official, Fire inspector, Fire Marshal, OSFM Deputy Director (Appointment by Governor Pete Wilson), and while there had the ABI-Unit as one of my two Divisions to oversee. Additionally, as a "retired annuitant" I have worked for the OSFM since my retirement in April 1999 on several projects and serve on 10-11 Advisory Committees, Task Forces, Work Groups, etc. Additionally, Consultant Hart was the Director of the Fire Sprinkler Advisory Board of Southern California for seven (7) years and since retiring has been a consultant to the National Automatic Sprinkler IP-Fund for nearly 10-years.

General Descriptive Summary:

At approximately 3:45 p.m. on Tuesday, August 18, 2009 the Truckee Fire Protection District responded to a reported fire and explosion at the Henness Flats Apartment Complex, 11929 Waters Way, Truckee, CA. It should be noted
that the Henness Flats Apartment Complex is a 92-unit apartment complex owned by The Pacific West Companies and the facility management partner is Cambridge Real Estate Services. According to City of Truckee records (Dept. of Building & Safety) the Building Permits for the eleven (11) buildings were issued on June 28, 2009 and the Final Inspection (Certificate of Occupancy) issued on September 20, 2007.

Note: According to the Town of Truckee Newsletter (Issue: 13 – Dated November 2005) this Apartment Complex was first submitted as “Gray’s Crossing”, a 92-unit complex of affordable rental housing and was included in the Development Plan and through efforts by the Town of Truckee obtained almost $3.5-million in additional grant dollars.

The unit where the fire and explosion occurred was located on the first floor and was on the east end of the building. The automatic fire sprinkler system riser which served the 12-unit apartment building was located on the exterior wall adjacent to this unit. The unit where the fire and explosion occurred was occupied by five (5) individuals and the force of the blast caused window glass to be blown more than 86-feet across the adjacent parking area of the complex. The force of the blast also caused an interior door frame and attached door to an adjacent bathroom to be pulled out approximately 3-inches from the frame in which it was installed.

As a result of the fire and explosion the five occupants all received burn injuries from the resulting blast. The mother, 27-year old Isela Minutti died of her injuries shortly after being airlifted to a Reno Hospital. The husband/father, 30-year old Wuliber Martinez who was burned over 40-45% of his body was airlifted to UC Davis Medical Center Burn Unit, Sacramento, CA. Their three small children, 12-years old, 7-year old and a 10-day old baby, were treated at Tahoe Forest Hospital on Tuesday and released to relatives that evening.

There are twelve (12) individual apartment buildings within the complex, of which Building No. 6 was a 2-story structure consisted of 12-apartment units. This structure was the largest structure within the complex, having a floor area of approximately 14,798 square feet. The first floor has (2) two bedroom units and (4) three bedroom units. The second floor has (2) two bedroom units and (4) three bedroom units. The two bedroom units are at each end of the building with the (4) three bedroom units in the middle. The area of the first floor is 7,776 square feet and the second floor is approximately 7,022 square feet.
Note: It should be noted that Building No. 6 and No. 8 are identical in size and are the largest structures within the 92-unit apartment complex. Additionally, the two bedroom units are 1,011 square feet in floor area, while the three bedroom units are 1,199 square feet.

The modular structures were built at the Guerdon Enterprises, LLC Facility, 5556 Federal Way, Boise, Idaho and the fire sprinkler piping (CPVC) was installed at that time, transported to the Truckee, CA site where they were assembled and the final connections of the residential fire sprinkler system completed. The fire sprinkler contractor that installed the fire sprinkler piping in the modular units in the Guerdon Enterprises facility was Simplex-Grinnell, 8783 W. Hackamore Drive, Boise, Idaho 83709. The Fire Protection Contractor that made the final connections between each modular unit and to the water mains, risers, and water supply was Simplex-Grinnell Fire Protection Systems, Co., 1655 Marietta Way, Sparks, Nevada 89431 Phone: (775-331-0590).

It is further noted that the fire sprinkler drawings and calculations (four sheets FP-1 thru FP-4) were “Drawn by: TS” (dated: 05-22-06), “Designed by: TS” (dated: 04-03-06) and “Approved by: RA” (Dated: 04-03-06) and due to the fact that the design and installation was performed by an “out-of-state” Fire Protection Contractor, the drawings were stamped and signed by Jerry L. O’Neal, a Registered Fire Protection Engineer (#1586) and plans date stamped December 31, 2007.

The City of Truckee Building & Safety Department and Truckee Fire Protection District employed the services of Mr. Eric Price, Senior Project Manager with Engineered Fire Systems, Inc. (13457 Colfax Highway, Grass Valley, CA 95945 – Phone (530) 274-9400 and E-mail: eprice@efs1.com) to perform the plan review for the fire sprinkler system drawings and supportive hydraulic calculations as well as perform the actual field inspections, witnessed testing, and final approval of the fire sprinkler systems.

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(Antifreeze Solution for Potable Water [NFPA-13:7.5.2.2]) and Glycerine Used –
Solution: 50% Water – Freezing Point: -20.9-degrees F.

Note: According to Mr. Eric Price, he ran the volume calculations for
Building No. 6 and came up with a volume of 371.6 gallons. The 4-inch main has
a volume of 133.3 gallons. It is possible that the volume calculations of 256.2 did
not include the 4-inch main.

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In discussions with ABI Investigator Tony Guevara it appears that Mr.
Wuliber Martinez was apparently cooking (frying) onions in a frying pan over the
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kitchen sink with the flaming frying pan to put water on the fire and the fire
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resulted. As a result of the fire and explosion it was noted that eight (8) of the ten
(10) residential sprinklers within the unit activated.

In addition, his wife 27-year old Isela Minutti was apparently standing in
the Dining Room/Living Room area (adjacent to the Kitchen counter) and the
resulting burns/explosion caused her death. According to footprints on the rug in
the Dining Room/Living Room she was approximately 5- to 7-feet from the initial
sprinkler that activated over the kitchen sink. From where her body was found
when rescuers arrived, she fell toward the window in the Living Room which was
blown outward.

A photograph, taken by ABI Investigator Tony Guevara of the fire sprinkler
over the Kitchen Sink was a Residential Pendent Sprinkler (decorative, fast
response, frangible bulb sprinkler) Model TY-2234 (SIN TY2234 – 4.9 K-factor)
and the ceiling was a flat-smooth ceiling. In accordance with U/L 1626
(Residential Sprinklers for Fire-Protection Service) the temperature classification
rating for this fire sprinkler is Ordinary (135-170 [155-degrees F] with a maximum
ceiling temperature of 100-degrees F).
It is of interest that in U/L 1626 (Section 41.6 – Exposure to antifreeze solutions) five (5) samples are to be assembled onto a manifold. The manifold is to be partially filled, such that the inlet of each sample is exposed to the following antifreeze solutions (70% glycerine/30% tap water mixture - by volume) for 90-days at a temperature of 189-degrees +/- 3.6-degrees F.

On Tuesday August 25, 2009 Consultant Stephen Hart visited the Henness Flats Apartment Complex, 11929 Waters Way, Truckee, CA with ABI Investigator Tony Guevara and Division Chief Ben Ho/Cal-Fire [Fire Engineering], arriving at approximately 11:00 a.m. and met with Fire Marshal/Deputy Chief Bob Bena of the Truckee Fire Protection District. The walk-thru of the apartment revealed that the fire sprinklers had been replaced, and that the sprinkler system was being serviced for the entire building. The unit of fire origin was being dried out and the walls had been cleaned with the exception of the Kitchen, which was left in the same condition in which it was found upon response on August 18th at 3:45 p.m.

The frying pan was still in the sink. The kitchen cabinets were scorched but not heavily burned. The fire damage was minimal; however, the explosion damage was evident by the door and doorframe in the doorway of the adjacent bathroom. The rugs had been pulled up and dried out. The windows had been replaced, Consultant Hart took several photographs of the interior and exterior of the apartment building, and the riser assembly on the east end of the building. The walls of the unit were relatively clean, but will most likely be repainted. The unit reflected having had a very quick fire and accompanying explosion.

Research on Antifreeze Materials:

In researching the two basic antifreeze materials, Propylene Glycol and Glycerin, it was found that both come in "ready-to-use" or "concentrated" solutions. The two types of antifreeze come in standard quantities of 1-gallon plastic bottles (6 per case), 5-gallon pails, 30-gallon drums, 55-gallon drums, 275-330-gallon totes, and 5,000-gallon tank truck.

Specific Gravity of Glycerine runs from 1.141 to 1.096 and Propylene Glycol runs from 1.033 to 1.020 for "ready-to-use" solutions and 1.165 to 1.100 and 1.045 to 1.027 respectively for concentrated solutions.
In reading several of the Material Safety Data Sheets both Propylene Glycol and Glycerine Solutions are classified as Class 1 flammable liquids in higher concentrations and often have a handling statement stating "Avoid generation of mist." Under Physical and Chemical Properties the Explosion Properties states "Not to be expected".

The National Fire Protection Association issues guidelines for the installation of fire sprinkler systems. NFPA-13, the Standard for the Installation of Sprinkler Systems, states that for potable water systems, only pure glycerine (C.P. or U.S.P. 96.5 percent grade) or propylene glycol can be added to prevent freezing. A mixture of 50% glycerine and 50% water protects against freezing for temperatures down to -20.9-degrees F, while 50% water/50% propylene glycol protects down to -26-degrees F. Antifreeze systems are limited to sprinkler systems with a volume capacity of 40 gallons or less; so, the actual discharge of non-toxic antifreeze agent would be 20 gallons or less for a 50/50 solution.

The NFPA Automatic Sprinkler Systems Handbook, Section A-4.5.1 of NFPA-13, 1999 Edition (page 185) states: "Antifreeze solutions can be used for maintaining automatic sprinkler protection in small, unheated areas. Antifreeze solutions are recommended only for systems not exceeding 40 gallons."

"Commentary: The current reaction by a number of water purveyors to the use of antifreeze solutions in sprinkler systems has impacted the antifreeze system option, even though NFPA-13 only allows the use of nontoxic antifreeze solutions when the system is connected to the public water supply. Many local regulations require antifreeze systems to be equipped with a reduced -pressure zone backflow prevention device to guard against potential contamination of the public water supply. These local regulations have impacted the economic advantages offered by antifreeze systems to some degree.

A distinction is made between the use of additives for potable and non-potable water. The solutions noted in Table 4-5.2.1 could be described as food-grade chemicals.

The size limitation of antifreeze systems is only a recommendation because of the cost, not because of system performance. NFPA-13 does not place any limitation on the size of antifreeze systems."

The NFPA-13, 2002 Edition (Standard for the Installation of Sprinkler Systems) Annex A 7.5.2 (page 13-223) states: "A.7.5.2 Listed CPVC sprinkler pipe and fittings should be protected from freezing with glycerine only. The use
of diethylene, ethylene, or propylene glycol are specifically prohibited. Laboratory testing shows that glycol-based antifreeze solutions present a chemical environment detrimental to CPVC."

The NFPA-13, 2002 Edition (Standard for the Installation of Sprinkler Systems) Annex A.5.3.1 (page 13-223) states: "A 7.5.3.1 All permitted antifreeze solutions are heavier than water. At the point of contact (interface), the heavier liquid will be below the lighter, preventing diffusion of water into the unheated areas."

The NFPA Automatic Sprinkler Systems Handbook, Section 7.5 of NFPA-13, 2002 Edition (page 162) states: "Commentary: Antifreeze systems, which are covered in Section 7.5, are typically used as subsystems of a wet pipe system. Antifreeze systems are intended to protect small areas that could be exposed to freezing temperatures, such as outside loading docks. Antifreeze systems are also used for residential areas that are not protected against freezing temperatures, since residential sprinklers are currently listed only for wet pipe systems."

**Special Note:** The NFPA Automatic Sprinkler System Handbook, Appendix Section 4-5.3.1 of NFPA-13, 1999 Edition (page 189) states: "All permitted antifreeze solutions are heavier than water. At the point of contact (interface), the heavier liquid will be below the lighter liquid, preventing diffusion of water into the unheated areas. "Commentary: Since all permitted antifreeze solutions are heavier than water, an interface at which the water in the wet system will stay above the heavier antifreeze solution is created. If possible, the entire antifreeze system should be below the level of this interface, this preventing the diffusion of water into low temperature areas. When the antifreeze system is above the interface, alternative piping arrangements and additional system components as illustrated in Figure 4-5.3.1 and 4-5.3.2 are necessary."

The NFPA-25, 2006 California Edition further states in Annex A-5.3.4 (page 25-60): "Listed CPVC sprinkler pipe and fittings should be protected for freezing with glycerin only. The use of diethylene, ethylene, or propylene glycols is specifically prohibited. Where inspecting antifreeze systems employing listed CPVC piping, the solution should be verified to be glycerine based."

The NFPA-25, Standard for the Testing, and Maintenance of Water-Based Fire Protection Systems Handbook, 2002 First Edition (page 78) states: "Commentary: New antifreeze solutions are being introduced for use in early suppression fast-response (ESFR) systems and NFPA-13, 2002, restricts the use of antifreeze in ESFR systems to those that are listed specifically for that use. Some ESFR systems may require additional inspection, testing, and maintenance compared to the traditional systems used today and covered by (Section) 5.3.4). In such cases, the manufacturer’s recommendations should be followed.

Because antifreeze systems usually are used in small systems, additional inspection, testing, or maintenance activities may be required to ensure uniform mixtures when large antifreeze systems are used to protect large systems. An example of such additional activities would be circulating the mixture to prevent the antifreeze from settling out of the solution."

According to the Material Safety Data Sheet provided for Hill Brothers Chemical Company on their product name: Propylene Glycol (CAS Number: 57-55-6 and MSDS No. CP21500) under Section V – Fire Fighting Measures, the product has a flash point of 214- to 225-degrees F, Lower Explosive Limits: 2.6/Upper Explosive Limits 12.5, and it is noted under Unusual Fire and Explosion Hazards: This material may burn, but will not ignite readily. If container is not properly cooled, it may explode in the heat of a fire. Vapors are heavier than air and may accumulate in lower areas.

**Similar Case of Fire and Explosion:**

In researching the use of antifreeze solutions in fire sprinkler systems a similar activation and explosion occurred on October 28, 2001 at 5:21 p.m. at the Windandsea (Wind and Sea) Restaurant, 56 Shrewsbury Avenue, Highlands, New Jersey. According to the Fire Investigation Report, prepared by the County of Monmouth Office of the Fire Marshal, 1027 Highway 33, East, Freehold, New Jersey 07728 [Phone: (732-938-5323], the structure was a three (3) story wood
frame building. The second and third floors were protected by an antifreeze type fire sprinkler system.

According to a statement from the witnesses working or eating in the second floor restaurant/enclosed deck they heard a pop sound and a fire sprinkler activated and then saw a liquid spraying down from above. Followed by a fireball developing at the ceiling in the area where a ceiling mounted heater was located.

Located near the ceiling were nine (9) Sun Pak heaters rated at 25,000 BTU’s each. On the wall to the rear of the row of ceiling heaters were sidewall mounted fire sprinklers. These sprinklers were supplied by a Propylene Glycol filled – antifreeze solution sprinkler system. The sidewall sprinklers installed were Viking Model M – Ordinary Classification – Nominal Temperature Rating 155-degrees F, maximum recommended ceiling temperature 100-degrees F.

The cause of the fire and explosion was in the opinion of the investigators present that the heat at the ceiling level at the rear of the heater in the area of the sidewall sprinkler reached the temperature that caused the sprinkler to activate. “When the system activated, the mixture of Propylene Glycol and water sprayed under pressure on to the ceiling heater located in front of the sidewall sprinkler. At that time the vapors from the sprayed liquid mixture ignited and flash fire occurred.”

Two injured people were transferred to Saint Barnabus Burn Center. A partial list of the injured was included in the report prepared by MCPO Detective Hubeny. That list included 18 injuries.

**Special Note:** It should be noted that on page 4 of 6 of the Sunpak Patio Heater cut-sheets, under the Fire Sprinklers Section is the following statements: Fire Sprinklers must be located at an appropriate distance from each heater to avoid accidental activation of the sprinkler. Ethylene Glycol or Propylene Glycol must never be used in fire sprinklers where heaters are present as these substances may become flammable when heated. A fire sprinkler professional must be consulted when heaters are installed where fire sprinklers are present to insure that heaters and the fire sprinkler system are properly integrated. Specific guidelines can be found in NFPA-13 regarding design and specifications for Fire Sprinkler Systems near heaters.
Conclusion:

Points to be considered:
- The ambient temperature in Truckee, Ca on August 18, 2009 at approximately 3:45 p.m. was between 80- and 85-degrees F.
- The origin of the fire and the open flame of the frying pan and the heat release thereof.
- There are several similarities between the New Jersey Incident (10-28-01) and the Truckee, CA Incident (08-18-09):
  - Both incidents involved a fire sprinkler system with antifreeze mixture,
  - Both incidents had fire and explosion on lower floor level of a multi-level structure (Highlands, New Jersey 2nd and 3rd floor antifreeze, fire and explosion on 2nd floor; Truckee, CA 1st and 2nd floor antifreeze, fire and explosion on first floor),
  - Concentrations were designed for 50%/50% mixture (Glycerine/Water).
- Truckee System contained volume of 371.6 gallons which at 50%/50% would be 185.8/Glycerine/185.8/Water.
- According to Investigator Tony Guevara/Cal-Fire (ABI) samples were taken from this building (No. 6) and other buildings in the complex by Truckee Fire Protection District (Fire Marshal Bob Bena) and Investigators from the Bureau of Alcohol, Tobacco & Firearms and sent to a laboratory and results came back with readings in the ranges above 60%.
- Since all permitted antifreeze solutions are heavier than water, an interface at which the water in the wet system will stay above the heavier antifreeze solution is created, thus the concentration of antifreeze would settle to the 1st floor portion of the system.
- The design characteristics of a residential fire sprinkler:
  - Fast response sprinkler technology,
  - Actual Delivered Density (ADD) – the measurement of the rate at which water is placed on the surface of a burning combustible array,
  - Required Delivered Density (RDD) – the measurement of a particular material’s ability to be suppressed once ignited,
  - Response Time Index (RTI) – the sensitivity of the fire sprinkler to activate,
  - Deflector design characteristics, which relate to the droplet size,
  - General discharge characteristics (water distribution) of a residential fire sprinkler with a “wall-wetting pattern”,
  - Activation of the initial residential fire sprinkler (TY-2234) over the kitchen sink,
  - Proximity of the residential fire sprinkler in relationship to the sink in the Kitchen,
  - Smooth flat ceiling of 8-feet above the floor level,
  - Southwest Gas did not find any gas leakage.
Fire damage to the apartment unit, and to the contents (as seen by reviewing the photographs of Investigator Tony Guevara/Cal-Fire (ABI) showing that a "flash fire" occurred but the damage from the fire was minimal and that the damage from the resulting explosion was extremely intense.

It is therefore the opinion of this writer, that the fire and resulting explosion at the Henness Flats Apartment Complex. 11929 Waters Way, Truckee, CA on August 18, 2009 at approximately 3:45 p.m. was most likely caused by Mr. Wuliber Martinez, age 30-years; who was apparently cooking onions in a frying pan (approximately 8- to 10-inch diameter) and upon finding the pan on fire while on the stove, took the pan by the handle and turned around (180-degrees) and while attempting to extinguish the flames, the fire sprinkler directly above him activated, discharging a solution of glycerine-based antifreeze which was ignited by the flames coming from the burning onions in the frying pan and the resulting explosion of the glycerine solution cause fatal burn injuries to his wife, Islesa Minutti, Age 27-years; and burn and blast injuries to him and their three (3) children; ages 12-years, 7-years, and 10-days old.

Questions which need to be researched:

1) What was the "cause of death" of Islesa Minutti?
2) Was there any Glycerine residue found in her lungs?
3) Was there any Glycerine residue found in Mr. Wuliber Martinez’s lungs?
4) What was the actual readings of Glycerine found in Building No. 8 (the identical building to Building No. 6)
5) Was there any records obtained from Grinnell Fire Protection (Sparks, NV) which show how much Glycerine was purchased for this jobsite?
6) Who was the manufacture of the Glycerine used on this project, and was it ordered as “Ready-to use” (50%/50%) or “Concentrated”?
7) “If” it was concentrated Glycerine, who and how was it mixed and/or filled into the fire sprinkler system(s)?
8) Does the CA Dept. of Housing & Community Development (HCD) have records for the modular units constructed in Idaho and transported to Truckee, CA and assembled?
9) Did Simplex-Grinnell (Sparks, NV) have a CA Contractors State License Board (CSLB) Fire Protection Contractors (C-16) license, or were they using the CA Branch offices license(s)?
10) What does NFPA consider to be a “Large Antifreeze System” which is referenced in the NFPA-25, Standard for the Testing, and Maintenance of

Stephen D. Hart, Consultant
(National Automatic Sprinkler IP-Fund)
Date: September 17, 2009
Fire & Explosion Investigation
Report
By: Stephen Hart, Consultant

Date of Incident:
August 18, 2009 (Tuesday)
15:45 p.m. (approximate)

Location of Incident:
Henness Flats Apartments
11929 Waters Way (Building No. 6, Unit 101)
Truckee, CA

Scope/Purpose:
On August 20, 2009 Acting California State Fire Marshal Tonya
Hoover/CAL-FIRE called Consultant Hart and indicated that there had been a fire
and explosion in Truckee, CA and that his assistance was requested to aid ABI-
Unit Investigator Tony Guevara in the investigation. According to Acting SFM
Hoover the fire and explosion was in a newly constructed apartment building with
a fully operational fire sprinkler system.

Note: It should also be pointed out that Consultant Hart has more than
44-plus years of experience with construction techniques, inspection practices,
codes and standards, as well as fire investigation. Consultant Hart has been a
Apprentice/ Journeyman Electrician, Building Inspector, Building Official, Fire
inspector, Fire Marshal, OSFM Deputy Director (Appointment by Governor Pete
Wilson), and while there had the ABI-Unit as one of my two Divisions to oversee.
Additionally, as a “retired annuitant” I have worked for the OSFM since my
retirement in April 1999 on several projects and serve on 10-11 Advisory
Committees, Task Forces, Work Groups, etc. Additionally, Consultant Hart was
the Director of the Fire Sprinkler Advisory Board of Southern California for seven
(7) years and since retiring has been a consultant to the National Automatic
Sprinkler IP-Fund for nearly 10-years.

General Descriptive Summary:
At approximately 3:45 p.m. on Tuesday, August 18, 2009 the Truckee Fire
Protection District responded to a reported fire and explosion at the Henness
Flats Apartment Complex. 11929 Waters Way, Truckee, CA. It should be noted
that the Henness Flats Apartment Complex is a 92-unit apartment complex
owned by The Pacific West Companies and the facility management partner is
Cambridge Real Estate Services. According to City of Truckee records (Dept. of
Building & Safety) the Building Permits for the eleven (11) buildings were issued
on June 28, 2009 and the Final Inspection (Certificate of Occupancy) issued on

Note: According to the Town of Truckee Newsletter (Issue: 13 – Dated
November 2005) this Apartment Complex was first submitted as “Gray’s
Crossing”, a 92-unit complex of affordable rental housing and was included in the
Development Plan and through efforts by the Town of Truckee obtained almost
$3.5-million in additional grant dollars.

The unit where the fire and explosion occurred was located on the first
floor and was on the east end of the building. The automatic fire sprinkler system
riser which served the 12-unit apartment building was located on the exterior wall
adjacent to this unit. The unit where the fire and explosion occurred was
occupied by five (5) individuals and the force of the blast caused window glass to
be blown more than 88-feet across the adjacent parking area of the complex.
The force of the blast also caused an interior door frame and attached door to an
adjacent bathroom to be pulled out approximately 3-inches from the frame in
which it was installed.

As a result of the fire and explosion the five occupants all received burn
injuries from the resulting blast. The mother, 27-year old Isela Minutti died of her
injuries shortly after being airlifted to a Reno Hospital. The husband/father, 30-
year old Wuliber Martinez who was burned over 40-45% of his body was airlifted
to UC Davis Medical Center Burn Unit, Sacramento, CA. Their three small
children, 12-years old, 7-year old and a 10-day old baby, were treated at Tahoe
Forest Hospital on Tuesday and released to relatives that evening.

There are twelve (12) individual apartment buildings within the complex, of
which Building No. 6 was a 2-story structure consisted of 12-apartment units.
This structure was the largest structure within the complex, having a floor area of
approximately 14,798 square feet. The first floor has (2) two bedroom units and
(4) three bedroom units. The second floor has (2) two bedroom units and (4)
three bedroom units. The two bedroom units are at each end of the building with
the (4) three bedroom units in the middle. The area of the first floor is 7,776
square feet and the second floor is approximately 7,022 square feet.
Note: It should be noted that Building No. 6 and No. 8 are identical in size and are the largest structures within the 92-unit apartment complex. Additionally, the two bedroom units are 1,011 square feet in floor area, while the three bedroom units are 1,199 square feet.

The modular structures were built at the Guerdon Enterprises, LLC Facility, 5556 Federal Way, Boise, Idaho and the fire sprinkler piping (CPVC) was installed at that time, transported to the Truckee, CA site where they were assembled and the final connections of the residential fire sprinkler system completed. The fire sprinkler contractor that installed the fire sprinkler piping in the modular units in the Guerdon Enterprises facility was Simplex-Grinnell, 8783 W. Hackamore Drive, Boise, Idaho 83709. The Fire Protection Contractor that made the final connections between each modular unit and to the water mains, risers, and water supply was Simplex-Grinnell Fire Protection Systems, Co., 1655 Marietta Way, Sparks, Nevada 89431 Phone: (775-331-0590).

It is further noted that the fire sprinkler drawings and calculations (four sheets FP-1 thru FP-4) were “Drawn by: TS” (dated: 05-22-06), “Designed by: TS” (dated: 04-03-06) and “Approved by: RA” (Dated: 04-03-06) and due to the fact that the design and installation was performed by an “out-of-state” Fire Protection Contractor, the drawings were stamped and signed by Jerry L. O’Neal, a Registered Fire Protection Engineer (#1586) and plans date stamped December 31, 2007.

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In reading several of the Material Safety Data Sheets both Propylene Glycol and Glycerine Solutions are classified as Class 1 flammable liquids in higher concentrations and often have a handling statement stating “Avoid generation of mist.” Under Physical and Chemical Properties the Explosion Properties states “Not to be expected”.

The National Fire Protection Association issues guidelines for the installation of fire sprinkler systems. NFPA-13, the Standard for the Installation of Sprinkler Systems, states that for potable water systems, only pure glycerine (C.P. or U.S.P. 96.5 percent grade) or propylene glycol can be added to prevent freezing. A mixture of 50% glycerine and 50% water protects against freezing for temperatures down to -20.9-degrees F, while 50% water/50% propylene glycol protects down to -26-degrees F. Antifreeze systems are limited to sprinkler systems with a volume capacity of 40 gallons or less; so, the actual discharge of non-toxic antifreeze agent would be 20 gallons or less for a 50/50 solution.

The NFPA Automatic Sprinkler Systems Handbook, Section A-4.5.1 of NFPA-13, 1999 Edition (page 185) states: “Antifreeze solutions can be used for maintaining automatic sprinkler protection in small, unheated areas. Antifreeze solutions are recommended only for systems not exceeding 40 gallons. *Commentary: The current reaction by a number of water purveyors to the use of antifreeze solutions in sprinkler systems has impacted the antifreeze system option, even though NFPA-13 only allows the use of non-toxic antifreeze solutions when the system is connected to the public water supply. Many local regulations require antifreeze systems to be equipped with a reduced-pressure zone backflow prevention device to guard against potential contamination of the public water supply. These local regulations have impacted the economic advantages offered by antifreeze systems to some degree.

A distinction is made between the use of additives for potable and non-potable water. The solutions noted in Table 4-5.2.1 could be described as food-grade chemicals.

The size limitation of antifreeze systems is only a recommendation because of the cost, not because of system performance. NFPA-13 does not place any limitation on the size of antifreeze systems.”

The NFPA-13, 2002 Edition (Standard for the Installation of Sprinkler Systems) Annex A 7.5.2 (page 13-223) states: “A.7.5.2 Listed CPVC sprinkler pipe and fittings should be protected from freezing with glycerine only. The use
of diethylene, ethylene, or propylene glycol are specifically prohibited. Laboratory testing shows that glycol-based antifreeze solutions present a chemical environment detrimental to CPVC.

The NFPA-13, 2002 Edition (Standard for the Installation of Sprinkler Systems) Annex A.5.3.1 (page 13-223) states: “A 7.5.3.1 All permitted antifreeze solutions are heavier than water. At the point of contact (interface), the heavier liquid will be below the lighter, preventing diffusion of water into the unheated areas.”

The NFPA Automatic Sprinkler Systems Handbook, Section 7.5 of NFPA-13, 2002 Edition (page 162) states: “Commentary: Antifreeze systems, which are covered in Section 7.5, are typically used as subsystems of a wet pipe system. Antifreeze systems are intended to protect small areas that could be exposed to freezing temperatures, such as outside loading docks. Antifreeze systems are also used for residential areas that are not protected against freezing temperatures, since residential sprinklers are currently listed only for wet pipe systems.”

Special Note: The NFPA Automatic Sprinkler System Handbook, Appendix Section 4-5.3.1 of NFPA-13, 1999 Edition (page 189) states: “All permitted antifreeze solutions are heavier than water. At the point of contact (interface), the heavier liquid will be below the lighter liquid, preventing diffusion of water into the unheated areas. “Commentary: Since all permitted antifreeze solutions are heavier than water, an interface at which the water in the wet system will stay above the heavier antifreeze solution is created. If possible, the entire antifreeze system should be below the level of this interface, this preventing the diffusion of water into low temperature areas. When the antifreeze system is above the interface, alternative piping arrangements and additional system components as illustrated in Figure 4-5.3.1 and 4-5.3.2 are necessary.”

The NFPA-25, 2006 California Edition further states in Annex A-5.3.4 (page 25-60): “Listed CPVC sprinkler pipe and fittings should be protected for freezing with glycerin only. The use of diethylene, ethylene, or propylene glycols is specifically prohibited. Where inspecting antifreeze systems employing listed CPVC piping, the solution should be verified to be glycerine based.”


**Commentary:** New antifreeze solutions are being introduced for use in early suppression fast-response (ESFR) systems and NFPA-13, 2002, restricts the use of antifreeze in ESFR systems to those that are listed specifically for that use. Some ESFR systems may require additional inspection, testing, and maintenance compared to the traditional systems used today and covered by (Section) 5.3.4). In such cases, the manufacturer's recommendations should be followed.

Because antifreeze systems usually are used in small systems, additional inspection, testing, or maintenance activities may be required to ensure uniform mixture when large antifreeze systems are used to protect large systems. An example of such additional activities would be circulating the mixture to prevent the antifreeze from settling out of the solution.

According to the Material Safety Data Sheet provided for Hill Brothers Chemical Company on their product name: Propylene Glycol (CAS Number: 57-55-6 and MSDS No. CP21500) under Section V – Fire Fighting Measures, the product has a flash point of 214- to 225-degrees F, Lower Explosive Limits: 2.6/Upper Explosive Limits 12.5, and it is noted under Unusual Fire and Explosion Hazards: This material may burn, but will not ignite readily. If container is not properly cooled, it may explode in the heat of a fire. Vapors are heavier than air and may accumulate in lower areas.

**Similar Case of Fire and Explosion:**

In researching the use of antifreeze solutions in fire sprinkler systems a similar activation and explosion occurred on October 28, 2001 at 5:21 p.m. at the Windandsea (Wind and Sea) Restaurant, 56 Shrewsbury Avenue, Highlands, New Jersey. According to the Fire Investigation Report, prepared by the County of Monmouth Office of the Fire Marshal, 1027 Highway 33, East, Freehold, New Jersey 07728 [Phone: (732-938-5323), the structure was a three (3) story wood
frame building. The second and third floors were protected by an antifreeze type fire sprinkler system.

According to a statement from the witnesses working or eating in the second floor restaurant/enclosed deck they heard a pop sound and a fire sprinkler activated and then saw a liquid spraying down from above. Followed by a fireball developing at the ceiling in the area where a ceiling mounted heater was located.

Located near the ceiling were nine (9) Sun Pak heaters rated at 25,000 BTU's each. On the wall to the rear of the row of ceiling heaters were sidewall mounted fire sprinklers. These sprinklers were supplied by a Propylene Glycol filled – antifreeze solution sprinkler system. The sidewall sprinklers installed were Viking Model M – Ordinary Classification – Nominal Temperature Rating 155-degrees F, maximum recommended ceiling temperature 100-degrees F.

The cause of the fire and explosion was in the opinion of the investigators present that the heat at the ceiling level at the rear of the heater in the area of the sidewall sprinkler reached the temperature that caused the sprinkler to activate. “When the system activated, the mixture of Propylene Glycol and water sprayed under pressure on to the ceiling heater located in front of the sidewall sprinkler. At that time the vapors from the sprayed liquid mixture ignited and flash fire occurred.”

Two injured people were transferred to Saint Barnabus Burn Center. A partial list of the injured was included in the report prepared by MCPO Detective Hubeny. That list included 18 injuries.

**Special Note:** It should be noted that on page 4 of 6 of the Sunpak Patio Heater cut-sheets, under the Fire Sprinklers Section is the following statements: Fire Sprinklers must be located at an appropriate distance from each heater to avoid accidental activation of the sprinkler. Ethylene Glycol or Propylene Glycol must never be used in fire sprinklers where heaters are present as these substances may become flammable when heated. A fire sprinkler professional must be consulted when heaters are installed where fire sprinklers are present to insure that heaters and the fire sprinkler system are properly integrated. Specific guidelines can be found in NFPA-13 regarding design and specifications for Fire Sprinkler Systems near heaters.
Conclusion:

Points to be considered:

The ambient temperature in Truckee, Ca on August 18, 2009 at approximately 3:45 p.m. was between 80- and 85-degrees F.

The origin of the fire and the open flame of the frying pan and the heat release thereof.

There are several similarities between the New Jersey Incident (10-28-01) and the Truckee, CA Incident (08-18-09):

• Both incidents involved a fire sprinkler system with antifreeze mixture,

• Both incidents had fire and explosion on lower floor level of a multi-level structure (Highlands, New Jersey 2nd and 3rd floor antifreeze, fire and explosion on 2nd floor; Truckee, CA 1st and 2nd floor antifreeze, fire and explosion on first floor),

Concentrations were designed for 50%/50% mixture (Glycerine/Water).

Truckee System contained volume of 371.6 gallons which at 50%/50% would be 185.8/Glycerine/185.8/Water.

According to Investigator Tony Guevara/Cal-Fire (ABI) samples were taken from this building (No. 6) and other buildings in the complex by Truckee Fire Protection District (Fire Marshal Bob Bass) and Investigators from the Bureau of Alcohol, Tobacco & Firearms and sent to a laboratory and results came back with readings in the ranges above 60%.

The design characteristics of a residential fire sprinkler:

• Fast response sprinkler technology,

• Actual Delivered Density (ADD) – the measurement of the rate at which water is placed on the surface of a burning combustible array,

• Required Delivered Density (RDD) – the measurement of a particular material’s ability to be suppressed once ignited,

• Response Time Index (RTI) – the sensitivity of the fire sprinkler to activate,

• General discharge characteristics (water distribution) of a residential fire sprinkler with a “wall-wetting pattern”,

• Activation of the initial residential fire sprinkler (TY-2234) over the kitchen sink,

• Proximity of the residential fire sprinkler in relationship to the sink in the Kitchen,

• Smooth flat ceiling of 8-feet above the floor level,

Southwest Gas did not find any gas leakage.
Fire damage to the apartment unit, and to the contents (as seen by reviewing the photographs of Investigator Tony Guevara/Cal-Fire (ABI) showing that a “flash fire” occurred but the damage from the fire was minimal and that the damage from the resulting explosion was extremely intense.

It is therefore the opinion of this writer, that the fire and resulting explosion at the Henness Flats Apartment Complex, 11929 Waters Way, Truckee, CA on August 18, 2009 at approximately 3:45 p.m. was most likely caused by Mr. Wuliber Martinez, age 30-years; who was apparently cooking onions in a frying pan (approximately 8- to 10-inch diameter) and upon finding the pan on fire while on the stove, took the pan by the handle and turned around (180-degrees) and while attempting to extinguish the flames, the fire sprinkler directly above him activated, discharging a solution of glycerine-based antifreeze which was ignited by the flames coming from the burning onions in the frying pan and the resulting explosion of the glycerine solution cause fatal burn injuries to his wife, Islesa Minutti, Age 27-years; and burn and blast injuries to him and their three (3) children; ages 12-years, 7-years, and 10-days old.

Questions which need to be researched:

1) What was the “cause of death” of Islesa Minutti?
2) Was there any Glycerine residue found in her lungs?
3) Was there any Glycerine residue found in Mr. Wuliber Martinez’s lungs?
4) What was the actual readings of Glycerine found in Building No. 8 (the identical building to Building No. 6)
5) Was there any records obtained from Grinnell Fire Protection (Sparks, NV) which show how much Glycerine was purchased for this jobsite?
6) Who was the manufacture of the Glycerine used on this project, and was it ordered as “Ready-to use” (50%/50%) or “Concentrated”?
7) “If” it was concentrated Glycerine, who and how was it mixed and/or filled into the fire sprinkler system(s)?
8) Does the CA Dept. of Housing & Community Development (HCD) have records for the modular units constructed in Idaho and transported to Truckee, CA and assembled?
9) Did Simplex-Grinnell (Sparks, NV) have a CA Contractors State License Board (CSLB) Fire Protection Contractors (C-16) license, or were they using the CA Branch offices license(s)?
10) What does NFPA consider to be a “Large Antifreeze System” which is referenced in the NFPA-25, Standard for the Testing, and Maintenance of...

# # # # #

National Automatic Sprinkler IP-Fund

Date: September 17, 2009
SUMMARY:

A fire with explosion occurred on August 18, 2009 at approximately 1550 hours at 11907 Waters Way, Apt. 101, in Truckee. W-1 BOTTO, was nearby and hearing the incident ran to the scene. W-2 SPENCER and W-3 OSBURN were driving nearby, and hearing the incident, drove to scene. W-1 BOTTO used Hazmat-1 as CP initially. Truckee Fire Protection District (TFPD), Town of Truckee Police Department (ToTPD) CALFIRE, Northstar Fire Department (NFD), North Tahoe Fire Protection District (NTFPD), Careflight (helicopter), and Calstar (helicopter) were dispatched to the scene. V-1 was rescued by W-4 BERRY, V-2/V-3 self-rescued prior to TFPD arrival, V-4 was rescued by a bystander, V-5 was rescued by W-2 SPENCER. The fire with explosion appeared to have been extinguished by the fire sprinkler system. The fire alarm was functioning in the apartment of origin and the rest of the building. V-1/V-2 were transported by M92 to a helipad nearby for transport. V-3/V-4/V-5 were transported by M51 to Tahoe Forest Hospital. V-6 was given oxygen by the CALFIRE crew, then stated, “I am okay” and left scene. TFPD and ToTPD made primary search in unit 101. There was a report of trapped occupants in the apartment above the fire. ToTPD and TFPD made forcible entry for a primary search in unit 201, no one was found. Gas and electric utilities were turned off at the West end of building. The fire sprinkler was turned off and alarm was silenced. Fire investigation activities began. TFPD and ToTPD initiated a joint investigation.

VICTIM(s) / WITNESS(es):

- V-1
- V-2
- V-3
- V-4
- V-5
- V-6
- W-1 BOTTO, GARY
- W-2 SPENCER, PAUL
- W-3 OSBURN, KEN
- W-4 BERRY, BRYAN

(Unknown male treated, then left scene)

Truckee Fire Protection District
Truckee Fire Protection District
Truckee Fire Protection District
Town of Truckee Police Department
EVIDENCE:
Sample of solution collected from entrance door hallway sprinkler, Apt 101. Backflow inspection tag removed from riser Building 6. Evidence transferred to fire investigator Russ Auker, as part of joint investigation. A set of antifreeze samples are stored in the evidence locker.

WEATHER:
Weather at the time of the fire (all are approximate): Temp, (80 )°F ; Wind, SW (2-3 ) mph; Relative Humidity, (30 )%; cloud cover (0 )%

EQUIPMENT Apt 101:
Electric kitchen stove, gas water heater, gas forced air furnace

PROPERTY:
The Henness Flats Apartments are a low-income housing complex. The complex consists of 11 apartment buildings and 1 support structure on a multi-acre parcel. Each building is identified by a 5-digit address, with an informal 1 or 2 digit identifier used by staff and residents. The incident building’s legal address is 11097 Waters Way, Apartment 101. Further it is known as: Building 6, Apartment 101 or Apt. 6101. Building 6 is located at the southeast corner of the complex. The building is part of a complex constructed as affordable housing in 2007, owned by Truckee Pacific Associates, Nampa, Idaho; and managed by Cambridge Real Estate. Building 6, Apartment 101 is a ground floor two bedroom, one bath apartment located at the East end of the building. The building’s first floor is numbered 101 to 106 with the second floor numbered 201-206, both from east to west. Ten units were rented at the time of the incident with 103/203 being vacant. Five persons occupied Unit 101 at the time of the incident. Other units in building 6 were also occupied. The natural gas and electric shutoffs are located at the West end of the building. The property has a history of possible formaldehyde exposure to the occupants.

ESTIMATE OF LOSS: Unknown at this time.
Prefabricated modular building, Non-Custom, with possible damage to wall/floor assemblies of connected units—102 and 201.

NARRATIVE:
I responded to 11907 Waters Way upon hearing of a fire with smoke showing and injured residents. No fire was seen on arrival. Fire and law enforcement personnel were performing primary search/rescue activity. The fire sprinkler system in unit 101 was flowing water and appeared to have extinguished the fire prior to fire department arrival. Fire crews used an air monitor to check for LEL, oxygen, and carbon monoxide levels in Apt 101 and 201. No flammable/combustible levels were found. Oxygen levels were normal. Carbon monoxide levels were normal.
NARRATIVE (Continued):

Windows on the south end of the apartment were broken with glass extending 80+ feet into the parking lot. The tree adjacent to the South side of the apartment had fire damage with twig “freeze” noted on tree showing the fire pushed out of the windows into the parking area. In all, six victims were identified. Five were transported and one left after receiving oxygen from CALFIRE Engine 2364. I confirmed that the gas and electric utilities were turned off to the building.

I noted minimal fire damage to unit 101 upon first inspection. The front door lockset was broken with damage to bottom of door from doorstop. The front door doorstop was broken. The sprinkler head by front door had activated and continued to drip antifreeze solution. The ceiling light fixture in the hallway in front of the water heater was deformed with heat damage. The sprinkler head had activated. The electrical panel appeared to have some of the breakers pulled from the bus bar. In the kitchen, there was a door on the floor in the hallway, appearing to be from the north bedroom. Another door was broken in half lengthwise lying on the kitchen floor, appearing to be from the bathroom. The east facing kitchen window’s lower pane was broken with fire damage to the top of the bush outside. Broken glass and window curtains were scattered about outside the East side of the building. Minimal glass was seen inside on the floor. Fire damage was seen on the upper cabinets on both sides of the kitchen. The vent above the microwave was partially melted, and the light fixture lens was melted more extensively on the stove side. Soot is evident on the ceiling around the light fixture above the kitchen sink. The kitchen sprinkler head had been activated. Partially melted plastic items are on the kitchen counter between the kitchen/living-room. The refrigerator appears undamaged. The electric stove appears undamaged. A pot was located on the right front burner. W-2 SPENCER found the left front burner glowing red and turned the control off when he was performing a primary search. A skillet was found in the kitchen sink. Butter and oil were on the counter in the kitchen. Cooking activity was apparent in kitchen. The wall and ceiling paint does not appear blistered.

In the living room, the paint did not appear blistered or covered with soot. The sprinkler heads had activated. There appears to be fire damage (melting) to a chair in the middle of the room along with fire damage (melting) to the couch situated on the east wall—more damage can be seen on the left side (North) of the couch. The windows facing east are broken with glass inside and outside of frames on the ground and floor. The light fixture reflectors in the southeast corner of the room are partially melted. The windows facing south are broken out, with the window frames pushed out from the wall. Minimal glass was seen on the floor. The door on the southwest corner of the room was forced by ToTPD to rescue V-I. The door’s window appeared intact. Three mirrors were sitting on the floor leaning against the west living room wall without apparent damage. There appears to be slight melting of the carpet nap.
NARRATIVE (Continued):

In the hallway the light fixtures were partially melted and the sprinkler heads activated. Doors and door trim were lying on the floor. The paint did not appear blistered. No soot was apparent on walls or ceiling.

In the south bedroom, used by V-1/V-2/V-5, the door was intact with a hole partially through the door by a piece of wood trim from the north bedroom door jam. W-2 SPENCER found V-5 on the bed in this room behind a closed door. The sprinkler head had activated above the king size bed. No heat or fire damage is apparent in the room. The paint does not appear blistered. No soot was apparent on walls or ceiling. The window is broken, with glass inside and outside the frame. The sprinkler head in the closet was intact.

The bathroom door was missing and the frame torn from the wall towards the kitchen. The bathroom fan trim piece is pulled away from the ceiling and partially melted. The bathroom sprinkler has been activated. No blistering of paint was apparent. No soot was apparent on the walls or ceiling.

The north bedroom, used by V-3 and V-4, had the door torn from the frame and was lying on the floor between the bathroom and kitchen. The frame was almost completely torn from the wall opening. The window was broken out and the lower frame was lying on the floor. The ceiling light fixture was deformed and the sprinkler head was activated. V-4 may have been located in this room at the time of the incident. The North bedroom sprinkler head was activated. The paint does not appear blistered. No soot was apparent on walls or ceiling.

The complex’s manager notified the owner of the fire. We requested them to contact their insurance company for a fire investigator. Southwest Gas Company was notified of the incident and requested to respond.

Truckee Fire Protection District and Truckee Police Department initiated a joint investigation of the fire/explosion. The scene was inspected for evidence of a bomb or drug manufacturing paraphernalia, none was found. The gas piping in building 6 was inspected for leaks/failures, none found. The gas system or the water heater/forced air furnace appeared to function correctly. Southwest gas continued to perform system testing on the main gas line entering the complex with nothing found. The California State Fire Marshal’s Office and ATF were called for assistance. Representatives from The State Fire Marshal’s Office Sacramento, Tony Guevara, and ATF, Reno, arrived on scene 08/19/09 AM. The owner’s insurance investigator, Russ Auker, arrived on scene 08/19/09 AM. The owner called for a forensic engineer, Frank Hsu, expected arrival time of 08/19/09 late PM. Arriving personnel were briefed on what had been found and what had been done.
NARRATIVE (Continued):

The joint investigation team was expanded to include representatives from: TFPD, ToTPD, ATF, State Fire Marshal, and Southwest Gas, Russ Auker, and Frank Hsu. Russ Auker called John DeHaan, Ph.D., for consultation.

The sewer system was smoke tested by Truckee Sanitary District. No infiltration was seen inside the apartments. Fire investigator Auker discussed the flammability of the anti-freeze placed in the sprinkler system. A sample from the sprinkler head in the hallway was collected and transferred to evidence collection team.

The anti-freeze was pursued as the last potential source of fuel. Numerous samples of anti-freeze were collected from several sites in Building 6 along with each building in the complex to be sent for laboratory analysis.

CONCLUSION

A stovetop fire with explosion occurred in Building 6, Apt 101. Potential ignition sources were considered to include: pilot light(s), static electricity, igniters, open-flame, and electric stove burner. Potential fuel sources included: natural gas pipe leak(s), natural gas appliance(s) leaking or malfunctioning, methane gas from the sewer system, chemical release, formaldehyde release, sprinkler system solution, and butter and/or oil.

The sprinkler system anti-freeze solution in Building 6, Apt 101 cannot be excluded or confirmed as a contributing fuel source without further testing. Both laboratory and field tests will be needed to confirm the possibility that the antifreeze/water solution in the piping was capable of creating a combustible fuel/air mixture or of creating an explosive atmosphere that would cause the explosion that occurred.

Source of Ignition:
Electric stove top burner

Material First Ignited:
Oil and/or butter

Cause of Fire:
Oil and/or butter fire on stove.
POTENTIAL SOURCES OF IGNITION:

Smoking:
No cigarettes found in apartment

Equipment Use:
Electric stove being used by V-2 MARTINEZ at the time of the fire. Equipment potentially in use at the time of fire; gas water heater, electric cooking stove, and gas forced air furnace (thermostat turned off - gas valve on).

Children:
Of the three children home, two were old enough to be capable of playing with matches. V-3 was in kitchen and V-4 was in the North bedroom (away from origin of fire).

Miscellaneous:
No candles appeared to be in use or setting on furniture at the time of the incident.

Incendiary:
Evidence found to be consistent with accidental cause.

ATTACHMENTS:
Photo Log
Building Diagram
PRESS RELEASE

Date of Release: August 18, 2009
Date/Time of Occurrence: August 18, 2009, 1551 hours
Nature of Incident: Residential Explosion
Location of Incident: Henness Flats Apartment Complex
Truckee PD Case Number: 09-001291
Released By: Lt. Harwood Mitchell 530-550-2333

The Truckee Police Department responded to a reported loud explosion at the Henness Flats Apartment Complex located at the intersection of Henness Road and Waters Way. The call came in shortly before 4:00 PM.

Officers arriving on scene located an apartment at the rear of the complex which had obvious damage consistent with an explosion. The apartment was determined to be occupied by a family of five. One adult and two children were located with injuries outside of the apartment when police and fire personnel arrived. It was learned that there was an adult female and infant still in the apartment. A Truckee Police Officer entered the apartment, located and removed an injured adult female. A Truckee Fire Firefighter entered the apartment and located an infant in a room inside the residence and brought the child out to safety.

All members of the family were transported for medical treatment. Both adults were in critical condition upon being transported. Both adults were transported by air-ambulance. The three children from the apartment were transported to the local Tahoe-Forest Hospital. The adult female later succumbed to her injuries.

The cause of the blast has not yet been determined. Representatives of the Truckee Building Department, Southwest Gas and Truckee Fire were on scene with Truckee Police personnel inspecting the apartment and adjoining units in search of any possible gas leaks or other safety concerns related to the blast. The building the damaged apartment is located in remains empty tonight while Truckee building officials and gas company employees continue to seek the cause of the blast. Residents of the damaged building were temporarily relocated by apartment complex management and the American Red Cross while the building remains uninhabitable while it is being inspected for safety.

Truckee Police were assisted in their initial response by the Nevada County Sheriff's office, California State Parks, and the Highway Patrol.
PRESS RELEASE

Date of Release: August 19, 2009
Date/Time of Occurrence: August 18, 2009, 1551 hours
Nature of Incident: Residential Explosion
Location of Incident: Henness Flats Apartment Complex
Truckee PD Case Number: 09-001291
Released By: Lt. Harwood Mitchell 530-550-2333

*** UPDATE ***

The Truckee Police Department responded to a reported loud explosion at the Henness Flats Apartment Complex located at the intersection of Henness Road and Waters Way on Tuesday, 8-18-09.

Officers determined there had been an explosion within an apartment at the complex. The apartment was occupied by a family of five including three children ages 12, 7 and 10 days old. The call came in shortly before 4:00 PM.

A 27 year old adult female resident of the apartment died as a result of injuries sustained in the blast. Her name is not being released at this time pending confirmation of notification of next of kin. The 30 year old male was transported to the UC Davis Medical Center in Sacramento where he is listed in critical but stable condition late this morning. The three children were released to relatives last night.

There are several families still displaced today while emergency personnel with assistance from Cal Fire and a special agent from the Federal Alcohol Tobacco and Firearms Agency (ATF) continue to investigate the cause of the explosion. At this time the cause of the explosion is still not known.

This call was originally reported as an unknown type disturbance with an explosion and possible shots fired. Officers responding to the call did not know what they were coming into upon arrival, but quickly assessed the scene determining it was an emergency aid call and began working on removing two family members from the apartment. One adult and two children were located with injuries outside of the apartment when police and fire personnel arrived. A Truckee Police Officer entered the apartment, located and removed an injured adult female. A Truckee Fire Firefighter entered the apartment and located an infant in a room inside the residence and brought the child out to safety.

A follow up press release will be posted at 5:00 PM
News Release

Contact: Gene Welch
Phone: 530-582-7635

FOR IMMEDIATE RELEASE
9 A.M. PST, August 20, 2009

HENNESS FLATS APARTMENT INCIDENT

TRUCKEE, CA, AUGUST 20, 2009: On Tuesday, August 18, 2009, there was a fire and explosion that occurred at the Henness Flats Apartments. Last night, August 19, 2009, the Town of Truckee Police Department completed their portion of the joint investigation and the Truckee Fire Protection District assumed control of the investigation.

The Truckee Police Department, along with Truckee Fire District, ATF, and Cal Fire investigators at this point believe that the fire and explosion were accidental in nature. At the time of this press release the cause of Tuesday’s explosion has not been determined and the investigation is ongoing.
The apartment complex owners, The Pacific Companies, have given their complete cooperation and assisted in any way possible to help expedite the investigation. Southwest Gas has been on site for the last two days testing all components of their natural gas distribution system. The company has completed extensive testing and there has been no indication of any failure or leaks in the natural gas system.

A quick recap of the incident was that the family of 2 adults and 3 children were occupying the downstairs apartment unit when the fire and blast occurred. The 2 adults were transported by air ambulance and the 3 children were transported by ground ambulance. The adult female succumbed to her injuries after arriving at Tahoe Forest Hospital. The adult male was transported to UC Davis Burn Center where he is being treated for his injuries. The 3 children were released that evening from Tahoe Forest Hospital.

-END-
FIRE AT HENNESS FLATS APARTMENT COMPLEX

TRUCKEE, CA, OCTOBER 15, 2009: On Tuesday, August 18, 2009 at approximately 3:50 P.M. there was a fire at the Henness Flats Apartment Complex, Building 6, 11907 Waters Way, Unit 101. There were 5 occupants in the unit at the time of the incident, 2 adults and 3 children.

The adults, who were in the kitchen and living room, were seriously burned, one of them fatally. The children were not burned and were transported to Tahoe Forest Hospital where they were examined and released to relatives. One of the adults was transported to UC Davis burn center in Sacramento for treatment while the second burn patient was diverted to Tahoe Forest hospital where she succumbed to her injuries.

~ MORE ~
The investigation has been ongoing since the incident occurred.
The fire investigation report prepared by the Truckee Fire Protection District was released today, October 15, 2009. A hard copy can be obtained at the Truckee Fire District Administrative Office, 10049 Donner Pass Road, for a fee of $15.00.

Recapping the incident, a male adult was cooking with oil in the kitchen when the contents of the pan ignited. He then added water to the pan in an attempt to extinguish the fire. The high temperature of the oil caused the water to vaporize carrying the burning liquid upwards and creating a large fireball. The fireball activated the sprinkler system, which eventually extinguished the fire.

As a result of the incident, thorough reviews of all suppression and detection systems were conducted. This necessitated taking the automatic sprinkler system “Off-Line” to the buildings in the complex. The Fire District is working with the building owner to bring all systems back “On-Line” in accordance with industry standards meeting or exceeding all state and local ordinances. In the interim, the building owner has posted a fire watch 24 hours a day, seven days a week and will continue to do so until the system is back in service.

Truckee Fire Protection District strongly supports the use of residential sprinkler systems in the home. It has been proven
that these devices save lives and reduce the fire damage in residences while lowering insurance premiums. 90% of fires are contained with the use of one sprinkler head. Home sprinkler systems use a fraction of the water normally used by fire departments to extinguish a fire. For more information on home fire sprinkler systems go to: www.homefiresprinkler.org.

The safest method of extinguishing an oil fire in a cooking pan is to use a tight fitting lid to smother the fire. Always have a tight fitting lid available when cooking with oil. The second preferred method is to toss baking soda onto the burning contents. This will extinguish the fire. A class "B" fire extinguisher can accomplish the same thing, but you have to be careful about getting too close to the fire when using a pressurized dry chemical extinguisher. They are pressurized to around 195 pounds per square inch and can blow burning liquid out of the pan when discharged too close to the liquid. You should stand back 10-15' from the fire when attempting to use a dry chemical extinguisher and advance towards it while discharging the extinguisher. If you have any questions about kitchen fires or fire safety, contact the Truckee Fire Protection District Prevention Bureau at 530-582-7853 or visit our website at www.truckeefire.org.

-End-
Truckee Fire Protection District Photo Log

Henness Flat Apartment Fire, 11907 Waters Way

August 18, 2009 Incident Number 09-1736 Investigation Number 09-05

<table>
<thead>
<tr>
<th>Date</th>
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<th>DISPOSITION</th>
</tr>
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<tbody>
<tr>
<td>08/19/09</td>
<td>1</td>
<td>Building 6, looking NE at Apt 101 from parking lot</td>
<td>File</td>
</tr>
<tr>
<td>08/19/09</td>
<td>2</td>
<td>Building 6, looking SW, Apt 101 on left</td>
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</tr>
<tr>
<td>08/19/09</td>
<td>3</td>
<td>Building 6, looking SW, Apt 101, showing riser room</td>
<td>File</td>
</tr>
<tr>
<td>08/19/09</td>
<td>4</td>
<td>Building 6 looking South, showing East side of building</td>
<td>File</td>
</tr>
<tr>
<td>08/19/09</td>
<td>5</td>
<td>Building 6 looking West, showing entrances to building</td>
<td>File</td>
</tr>
<tr>
<td>08/19/09</td>
<td>6</td>
<td>Building 6 looking West, showing East side of building</td>
<td>File</td>
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<tr>
<td>08/19/09</td>
<td>7</td>
<td>Building 6 riser room</td>
<td>File</td>
</tr>
<tr>
<td>08/19/09</td>
<td>8</td>
<td>Building 6 looking West, showing East side of building/parking</td>
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</tr>
<tr>
<td>08/19/09</td>
<td>9</td>
<td>Building 6 looking NW, showing apt decks</td>
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</tr>
<tr>
<td>08/19/09</td>
<td>10</td>
<td>Building 6 looking NW, showing apt decks and hydrant</td>
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</tr>
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<td>08/19/09</td>
<td>11</td>
<td>Building 6, looking North at Apt 101</td>
<td>File</td>
</tr>
<tr>
<td>08/19/09</td>
<td>12</td>
<td>Parking lot South of Building 6 with fire apparatus</td>
<td>File</td>
</tr>
<tr>
<td>08/19/09</td>
<td>13</td>
<td>Building 6, looking North at Apt 101</td>
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<tr>
<td>08/19/09</td>
<td>14</td>
<td>Building 6, looking Northeast at Apt 101</td>
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</tr>
<tr>
<td>08/19/09</td>
<td>15</td>
<td>Parking lot South of Building 6 showing glass in parking lot</td>
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</tr>
<tr>
<td>08/19/09</td>
<td>16</td>
<td>Building 6, looking Northeast at Apt 101/201 from parking lot</td>
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<tr>
<td>08/19/09</td>
<td>17</td>
<td>Vehicle in front of living room windows, Apt 101</td>
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<tr>
<td>08/19/09</td>
<td>18</td>
<td>Deck/railing with bedroom window, Apt 101</td>
<td>File</td>
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<tr>
<td>08/19/09</td>
<td>19</td>
<td>Deck/railing, Apt 101 with ground</td>
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<td>08/19/09</td>
<td>20</td>
<td>Window of Apt 101 bedroom, railing of Apt 201</td>
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<tr>
<td>08/19/09</td>
<td>21</td>
<td>South wall/living room windows, Apt 101</td>
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<tr>
<td>08/19/09</td>
<td>22</td>
<td>South wall/living room windows, Apt 101 with ground</td>
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<td>23</td>
<td>South wall/living room windows, Apt 101/201</td>
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<td>08/19/09</td>
<td>24</td>
<td>Southeast corner of Apt 101 with Southeast window</td>
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<td>08/19/09</td>
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<td>East wall, Apt 101 to right of photo 24</td>
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<td>08/19/09</td>
<td>26</td>
<td>Apt 101/201 with tree and brush and debris</td>
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<td>Tree trunk, photo 26, South side of Apt 101 burn patterns</td>
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<tr>
<td>08/19/09</td>
<td>28</td>
<td>Upper tree, photo 26, South side of Apt 101 burn patterns</td>
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<td>Upper tree, photo 26, South side of Apt 101 burn patterns</td>
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<td>Upper tree, photo 26, South side of Apt 101 burn patterns</td>
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<tr>
<td>08/19/09</td>
<td>31</td>
<td>Needle freeze, photo 26, South side of Apt 101 burn patterns</td>
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<td>08/19/09</td>
<td>32</td>
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<td>08/19/09</td>
<td>33</td>
<td>Needle freeze, photo 26, South side of Apt 101 burn patterns</td>
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<tr>
<td>08/19/09</td>
<td>34</td>
<td>Hood of vehicle parked in front of Apt 101 livingroom windows</td>
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<tr>
<td>08/19/09</td>
<td>35</td>
<td>Hood/windshield of vehicle parked in front of Apt 101 livingroom windows</td>
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</table>
## Truckee Fire Protection District Photo Log

### Henness Flat Apartment Fire, 11907 Waters Way

**August 18, 2009 Incident Number 09-1736 Investigation Number 09-05**

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<thead>
<tr>
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<th>DISPOSITION</th>
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<tbody>
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<td>Windshield of vehicle parked in front of Apt 101 livingroom windows</td>
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<tr>
<td>08/19/09</td>
<td>37</td>
<td>Livingroom windows, Apt 101, looking from SE corner to West</td>
<td>File</td>
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<tr>
<td>08/19/09</td>
<td>38</td>
<td>Livingroom windows, Apt 101, looking from SE corner, to West</td>
<td>File</td>
</tr>
<tr>
<td>08/19/09</td>
<td>39</td>
<td>Livingroom windows, Apt 101, looking from SE corner to West</td>
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</tr>
<tr>
<td>08/19/09</td>
<td>40</td>
<td>Apt 101 hallway from front door</td>
<td>File</td>
</tr>
<tr>
<td>08/19/09</td>
<td>41</td>
<td>Common area closet showing access under building</td>
<td>File</td>
</tr>
<tr>
<td>08/19/09</td>
<td>42</td>
<td>Common area closet doors</td>
<td>File</td>
</tr>
<tr>
<td>08/19/09</td>
<td>43</td>
<td>Water heater/Mechanical room Apt 101</td>
<td>File</td>
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<tr>
<td>08/19/09</td>
<td>44</td>
<td>Looking into livingroom and edge of kitchen from hallway</td>
<td>File</td>
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<tr>
<td>08/19/09</td>
<td>45</td>
<td>Bedroom door in hallway</td>
<td>File</td>
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<tr>
<td>08/19/09</td>
<td>46</td>
<td>Bathroom door on kitchen floor</td>
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<tr>
<td>08/19/09</td>
<td>47</td>
<td>Bathroom door on kitchen floor</td>
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<tr>
<td>08/19/09</td>
<td>48</td>
<td>Kitchen stove from hallway</td>
<td>File</td>
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<tr>
<td>08/19/09</td>
<td>49</td>
<td>Microwave/kitchen cabinets above stove</td>
<td>File</td>
</tr>
<tr>
<td>08/19/09</td>
<td>50</td>
<td>Kitchen cabinets, window, and light fixture</td>
<td>File</td>
</tr>
<tr>
<td>08/19/09</td>
<td>51</td>
<td>Kitchen cabinets, east windows, and light fixture above sink</td>
<td>File</td>
</tr>
<tr>
<td>08/19/09</td>
<td>52</td>
<td>Kitchen cabinets, east window, and sink</td>
<td>File</td>
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<tr>
<td>08/19/09</td>
<td>53</td>
<td>Kitchen sink and left counter</td>
<td>File</td>
</tr>
<tr>
<td>08/19/09</td>
<td>54</td>
<td>Kitchen counter to right of sink</td>
<td>File</td>
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<tr>
<td>08/19/09</td>
<td>55</td>
<td>Kitchen counter from living room</td>
<td>File</td>
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<tr>
<td>08/19/09</td>
<td>56</td>
<td>Light fixture in living room just south of kitchen counter</td>
<td>File</td>
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<tr>
<td>08/19/09</td>
<td>57</td>
<td>Northeast living room window</td>
<td>File</td>
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<tr>
<td>08/19/09</td>
<td>58</td>
<td>Chair adjacent to Northeast living room window</td>
<td>File</td>
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<td>08/19/09</td>
<td>59</td>
<td>Left side of couch East wall of living room</td>
<td>File</td>
</tr>
<tr>
<td>08/19/09</td>
<td>60</td>
<td>Right side of couch East wall of living room with light fixture</td>
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<tr>
<td>08/19/09</td>
<td>61</td>
<td>South wall of living room with South windows</td>
<td>File</td>
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<tr>
<td>08/19/09</td>
<td>62</td>
<td>Southwest living room where V-1 was found</td>
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<tr>
<td>08/19/09</td>
<td>63</td>
<td>Southeast living room light fixture</td>
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<tr>
<td>08/19/09</td>
<td>64</td>
<td>South wall of living room with lower portion of South windows</td>
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<tr>
<td>08/19/09</td>
<td>65</td>
<td>South wall of living room with upper portion of South windows</td>
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<tr>
<td>08/19/09</td>
<td>66</td>
<td>Lower portion of South windows</td>
<td>File</td>
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<tr>
<td>08/19/09</td>
<td>67</td>
<td>Floor Southwest corner of living room</td>
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<tr>
<td>08/19/09</td>
<td>68</td>
<td>Floor Southwest corner of living room</td>
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<tr>
<td>08/19/09</td>
<td>69</td>
<td>Looking North into apt from South wall</td>
<td>File</td>
</tr>
<tr>
<td>08/19/09</td>
<td>70</td>
<td>Frame above hallway showing crack on upper left corner</td>
<td>File</td>
</tr>
<tr>
<td>08/19/09</td>
<td>71</td>
<td>North bedroom from doorway</td>
<td>File</td>
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</tbody>
</table>
# Truckee Fire Protection District Photo Log

**Henness Flat Apartment Fire, 11907 Waters Way**

August 18, 2009 Incident Number 09-1736 Investigation Number 09-05

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<tr>
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<td>72</td>
<td>East wall of North bedroom</td>
<td>File</td>
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<tr>
<td>08/19/09</td>
<td>73</td>
<td>Upper aspect, East wall of North bedroom</td>
<td>File</td>
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<tr>
<td>08/19/09</td>
<td>74</td>
<td>Upper aspect, Northwest corner West wall of North bedroom</td>
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<tr>
<td>08/19/09</td>
<td>75</td>
<td>West wall North bedroom</td>
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<tr>
<td>08/19/09</td>
<td>76</td>
<td>Bedroom hallway from North bedroom</td>
<td>File</td>
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<tr>
<td>08/19/09</td>
<td>77</td>
<td>Southwest lower aspect of bathroom</td>
<td>File</td>
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<tr>
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<td>78</td>
<td>Southwest upper aspect of bathroom</td>
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<td>08/19/09</td>
<td>79</td>
<td>Bathroom fan</td>
<td>File</td>
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<tr>
<td>08/19/09</td>
<td>80</td>
<td>Shower curtain Northwest upper aspect of bathroom</td>
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<td>08/19/09</td>
<td>81</td>
<td>Shower curtain Northwest lower aspect of bathroom</td>
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<tr>
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<td>82</td>
<td>Southeast lower aspect South bedroom</td>
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<td>08/19/09</td>
<td>83</td>
<td>Southwest lower aspect of South bedroom</td>
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<td>08/19/09</td>
<td>84</td>
<td>Northwest lower aspect of South bedroom with closet door</td>
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<tr>
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<td>85</td>
<td>Northwest upper aspect of South bedroom with closet door</td>
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<tr>
<td>08/19/09</td>
<td>86</td>
<td>South bedroom light fixture and sprinkler head</td>
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<td>87</td>
<td>Southeast upper aspect of South bedroom</td>
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<td>Hinge side of door with frame South bedroom lower aspect</td>
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<td>08/19/09</td>
<td>89</td>
<td>Hinge side of door with frame South bedroom upper aspect</td>
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<td>Latch side of door with frame South bedroom upper aspect</td>
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<tr>
<td>08/19/09</td>
<td>93</td>
<td>Bedroom hallway from South bedroom lower aspect</td>
<td>File</td>
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<tr>
<td>08/19/09</td>
<td>94</td>
<td>Bedroom hallway from South bedroom upper aspect</td>
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<td>08/19/09</td>
<td>95</td>
<td>Ceiling light fixture diffuser</td>
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<td>08/19/09</td>
<td>96</td>
<td>Latch side of bathroom door frame from south bedroom lower aspect</td>
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<tr>
<td>08/19/09</td>
<td>97</td>
<td>Latch side of bathroom door frame from south bedroom upper aspect</td>
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<td>08/19/09</td>
<td>105</td>
<td>Top latch side of bathroom door frame</td>
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</table>
Truckee Fire Protection District Photo Log

*Henness Flat Apartment Fire, 11907 Waters Way*

August 18, 2009 Incident Number 09-1736 Investigation Number 09-05

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<td>Floor bedroom hallway between bathroom and North bedroom</td>
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<td>107</td>
<td>Latch side North bedroom door frame middle aspect</td>
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<td>08/19/09</td>
<td>108</td>
<td>Latch side North bedroom door frame upper aspect</td>
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<td>08/19/09</td>
<td>109</td>
<td>Hinge side North bedroom door frame middle aspect</td>
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<td>08/19/09</td>
<td>110</td>
<td>Hinge side North bedroom door frame lower aspect</td>
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<tr>
<td>08/19/09</td>
<td>111</td>
<td>Hinge side North bedroom door frame upper aspect</td>
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<tr>
<td>08/19/09</td>
<td>112</td>
<td>Latch side door frame lower aspect North bedroom</td>
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<td>113</td>
<td>Latch side door frame middle aspect North bedroom</td>
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<td>114</td>
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<td>08/19/09</td>
<td>115</td>
<td>Hinge side door frame upper aspect North bedroom</td>
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<td>08/19/09</td>
<td>116</td>
<td>Hinge side door frame middle aspect North bedroom</td>
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<td>08/19/09</td>
<td>117</td>
<td>Hinge side door frame lower aspect North bedroom</td>
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<td>Washing machine hookups across from mechanical room</td>
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<td>Upper aspect furnace with air filter as found</td>
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<td>Upper aspect furnace with air filter as found with char</td>
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<td>08/19/09</td>
<td>126</td>
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<td>Upper aspect furnace with air filter as found with char</td>
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<tr>
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<td>128</td>
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<td>Forced air furnace label from front panel</td>
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<td>Lower aspect electrical panel</td>
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*F:\EVDCNLOG*

Standards Council Supplemental Agenda

August 3-5, 2010

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<td>Electrical panel circuit breakers pulled from bus bar</td>
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<td>Bottom inside aspect of latch side entry door</td>
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<td>08/19/09</td>
<td>145</td>
<td>Door stop base behind entry door</td>
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<td>08/19/09</td>
<td>146</td>
<td>Entry door showing damage, stop base, and broken stop</td>
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<td>147</td>
<td>Entry door showing broken latchset</td>
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<td>Closet master bedroom for entry under 1st floor (crawlspace)</td>
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<td>Intact sprinkler in master bedroom closet</td>
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<td>Closet master bedroom for entry under 1st floor (crawlspace) air monitoring for LEL, CO, O2</td>
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<td>Industrial Scientific ITX air monitor in use</td>
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<td>Hot water gas valve</td>
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<td>Paper on Kitchen counter</td>
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HYDRAULIC CALCULATION SUBMITTALS

Fire Sprinkler System

Project Number: 000000000

PROJECT NAME: ENTER PROJECT NAME

STREET ADDRESS. CITY, STATE

CONTRACT WITH:
GENERAL CONTRACTOR
ADDRESS, CITY, STATE
Water Supply Curve (C)

City Water Supply:
- C1 - Static Pressure: 95
- C2 - Residual Pressure: 50
- C2 - Residual Flow: 2500

Demand:
- D1 - Elevation: 14.509
- D2 - System Flow: 131.03
- D2 - System Pressure: 81.413
- Hose (Adj City)
- Hose (Demand): 100
- D3 - System Demand: 231.03
- Safety Margin: 13.038

Graph showing flow against pressure with points C1, C2, and D1, D2, D3.
## Fittings Used Summary

### SimplexGrinnell

#### Gray's Crossing bldg

<table>
<thead>
<tr>
<th>Fitting Legend Abbrev.</th>
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<tbody>
<tr>
<td>90° Standard Elbow</td>
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<tr>
<td>Generic Swing Check Vlv</td>
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</tr>
<tr>
<td>90° Flow Thru Tee</td>
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<tr>
<td>Wilkins 375</td>
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<td>5</td>
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*Fitting generates a Fixed Loss Based on Flow*
The maximum velocity is 20.55 and it occurs in the pipe between nodes 43 and 7.
### Final Calculations - Hazen-Williams

**SimplexGrinnell**  
Gray's Crossing bldg

<table>
<thead>
<tr>
<th>Hyd. Ref.</th>
<th>Qa</th>
<th>Dia. &quot;C&quot;</th>
<th>Fitting or Eqv.</th>
<th>Pipe Fitting's Total</th>
<th>Pt</th>
<th>Pt</th>
<th>Notes</th>
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### Notes

- **K Factor** = 4.90  
- **Vel** = 10.92
### Final Calculations - Standard

**SimplexGrinnell**  
**Gray's Crossing bldg**  

| Hyd. Ref. Point | Qa | Dia. "C" | "C" Fitting or Eqv. Ln. | Pipe Fting's Total | Pt Pf | Pt Pv | Pt Pn | Notes | * * * * * * * * * * *
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**Notes**  
- Vel = 9.12
- * Fixed loss = 11.349
- Vel = 2.95
- Vel = 3.23
- Qa = 100
- Vel = 1.60
- K Factor = 25.60
Fire Protection by Computer Design

SimplexGrinnell
12443 W. Executive Dr.
Boise Idaho 83713
208-376-2111

Job Name: GRAYSCROSSING
Building: 1
Location: 
System: 
Contract: 
Data File: Grays-Cr.WX2
City Water Supply:
C1 - Static Pressure: 95
C2 - Residual Pressure: 50
C2 - Residual Flow: 2500

Demand:
D1 - Elevation: 17.324
D2 - System Flow: 435.679
D2 - System Pressure: 84.308
Hose (Adj City): 100
Hose (Demand): 100
D3 - System Demand: 535.679
Safety Margin: 8.089

FLOW (N^1.85)

300 600 900 1200 1500 1800 2100 2400 2700

30 60 90 120 150

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
### Final Calculations - Hazen-Williams

#### Simplex/Grinnell

**GRAYS CROSSING**

<table>
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<tr>
<th>Hyd. Ref. Point</th>
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<th>Dia. &quot;C&quot;</th>
<th>Fitting or Eqv. Ln.</th>
<th>Pipe Fng's Total Pt</th>
<th>Pt</th>
<th>Pn</th>
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<tr>
<td>S101 to EQ01</td>
<td>14.82</td>
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<td>2E 5.32</td>
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<tr>
<td>S103 to EQ03</td>
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**Notes**

- K Factor = 5.60
- Vel = 5.50
- K Factor = 5.46
- Vel = 5.50
- K Factor = 5.33
- Vel = 5.50
- K Factor = 11.82
- Vel = 4.67
- K Factor = 12.11
- Vel = 8.59
- K Factor = 12.23
- Vel = 3.67
- K Factor = 7.04
- Vel = 10.49
- K Factor = 14.95
- Vel = 4.19
| Hyd. Ref. Point | Qa | Dia. "C" | Fitting or Eqv. Ln. | Pipe Ftn's Total | Pt Pe Pf Pe | Pt Pf Pe | Notes |
|----------------|----|----------|---------------------|------------------|----------|--------|-------|-------|
| 30 to 29       | 18.58 | 1.394 | 0.0 | 7.700 | 12.152 | K Factor @ node EQ02 |
| 29 to 24       | 38.49 | 0.0723 | 0.0 | 7.700 | 0.557 | Vel = 8.09 |
| 24 to 27       | 19.00 | 1.394 | 1T | 9.523 | 4.660 | 12.709 | K Factor @ node EQ02 |
| 27 to 23       | 57.49 | 0.1521 | 0.0 | 14.183 | 2.157 | Vel = 12.09 |
| 23 to 20       | 45.36 | 2.423 | 0.0 | 6.500 | 14.866 | Vel = 7.17 |
| 20 to 7        | 103.05 | 0.0303 | 0.0 | 6.500 | 0.197 | |
| 16 to 15       | 20.51 | 1.394 | 0.0 | 7.700 | 14.808 | K Factor @ node EQ02 |
| 15 to 14       | 20.51 | 0.0226 | 0.0 | 7.700 | 0.174 | Vel = 4.31 |
| 14 to 13       | 19.71 | 1.394 | 0.0 | 3.370 | 13.683 | K Factor @ node EQ02 |
| 13 to 12       | 40.22 | 0.0783 | 0.0 | 3.370 | 0.264 | Vel = 8.45 |
| 12 to 11       | 0.0 | 1.394 | 0.0 | 4.330 | 13.947 | Vel = 8.45 |
| 11 to 10       | 40.22 | 0.0788 | 0.0 | 4.330 | 0.341 | Vel = 8.45 |
| 10 to 9        | 20.15 | 1.394 | 0.0 | 3.080 | 14.288 | K Factor @ node EQ02 |
| 9 to 8         | 60.37 | 0.1662 | 0.0 | 3.080 | 0.512 | Vel = 12.69 |
| 8 to 7         | 0.0 | 1.394 | 0.0 | 1.580 | 14.800 | Vel = 12.69 |
| 7 to 6         | 60.37 | 0.1665 | 0.0 | 1.580 | 0.263 | |
| 6 to 5         | 0.0 | 1.394 | 0.0 | 1.580 | 0.263 | |
| 5 to 4         | 30.33 | 1.101 | 1T | 9.563 | 0.500 | 30.817 | K Factor @ node EQ01 |
| 4 to 3         | 30.33 | 0.1470 | 0.0 | 10.062 | 1.479 | Vel = 10.22 |
| 3 to 2         | 0.0 | 1.394 | 1E | 4.762 | 6.250 | 24.678 | Vel = 6.38 |
| 2 to 1         | 30.33 | 0.0466 | 0.0 | 20.534 | 0.956 | |
| 1 to 0         | 0.0 | 1.394 | 1E | 4.762 | 8.290 | 8.042 | K Factor @ node EQ03 |
| 0 to 1         | 15.49 | 0.0135 | 0.0 | 4.761 | 0.433 | Vel = 3.26 |
| 1 to 2         | 15.49 | 1.394 | 0.0 | 7.700 | 8.651 | K Factor @ node EQ02 |
| 2 to 3         | 15.68 | 1.394 | 0.0 | 7.700 | 0.376 | Vel = 6.55 |
| 3 to 4         | 14.81 | 1.394 | 0.0 | 7.700 | 7.728 | K Factor @ node EQ02 |
| 4 to 5         | 45.98 | 0.1006 | 0.0 | 7.700 | 0.775 | Vel = 9.67 |
| 5 to 6         | 15.55 | 1.394 | 1T | 9.523 | 4.700 | 8.503 | K Factor @ node EQ02 |
| 6 to 7         | 61.53 | 0.1724 | 0.0 | 14.223 | 2.452 | Vel = 12.93 |
| 7 to 8         | 40.06 | 2.423 | 0.0 | 6.500 | 10.955 | Vel = 7.07 |
Fire Sprinkler System

PROJECT NAME:
ENTER PROJECT NAME
STREET ADDRESS.
CITY, STATE

CONTACT WITH:
GENERAL CONTRACTOR
ADDRESS, CITY, STATE
Series LFII Residential Pendent Sprinklers
4.9 K-factor

General Description

The Series LFII (TY2234) Residential Pendent Sprinklers are decorative, fast response, frangible bulb sprinklers designed for use in residential occupancies such as homes, apartments, dormitories, and hotels. When aesthetics and optimized flow characteristics are the major consideration, the Series LFII (TY2234) should be the first choice.

The Series LFII are to be used in wet pipe residential sprinkler systems for one- and two-family dwellings and mobile homes per NFPA 13D; wet pipe residential sprinkler systems for residential occupancies up to and including four stories in height per NFPA 13R; or, wet pipe sprinkler systems for the residential portions of any occupancy per NFPA 13.

The Series LFII (TY2234) has a 4.9 (70.6) K-factor that provides the required residential flow rates at reduced pressures, enabling smaller pipe sizes and water supply requirements.

The recessed version of the Series LFII (TY2234) is intended for use in areas with finished ceilings. It employs a two-piece Style 20 Recessed Escutcheon. The Recessed Escutcheon provides 1/4 inch (6.4 mm) of recessed adjustment or up to 1/2 inch (12.7 mm) of total adjustment from the flush ceiling position. The adjustment provided by the Recessed Escutcheon reduces the accuracy to which the pipe nipples to the sprinklers must be cut.

The Series LFII (TY2234) has been designed with heat sensitivity and water distribution characteristics proven to help in the control of residential fires and to improve the chance for occupants to escape or be evacuated.

WARNINGS

The Series LFII (TY2234) Residential Pendent Sprinklers described herein must be installed and maintained in compliance with this document, as well as with the applicable standards of the National Fire Protection Association, in addition to the standards of any other authorities having jurisdiction. Failure to do so may impair the performance of these devices.

The owner is responsible for maintaining their fire protection system and devices in proper operating condition. The installing contractor or sprinkler manufacturer should be contacted with any questions.

Sprinkler/Model Identification Number

SIN TY2234

IMPORTANT

Always refer to Technical Data Sheet TFP700 for the "INSTALLER WARNING" that provides cautions with respect to handling and installation of sprinkler systems and components. Improper handling and installation can permanently damage a sprinkler system or its components and cause the sprinkler to fail to operate in a fire situation or cause it to operate prematurely.
The glass Bulb contains a fluid that expands when exposed to heat. When the rated temperature is reached, the fluid expands sufficiently to shatter the Bulb. The fluid in the Bulb, when exposed to heat, expands and causes the Bulb to break, activating the sprinkler system.

**Technical Data**

**Approvals:**
UL and C-UL Listed. NYC Approved under MEA 44-03-E.

**Maximum Working Pressure:**
175 psi (12.1 bar)

**Discharge Coefficient:**
K = 4.9 GPM/psi² (70.6 LPM/bar²)

**Temperature Rating:**
155°F/68°C or 175°F/79°C

**Finishes:**
White Polyester Coated, Chrome Plated, or Natural Brass

**Physical Characteristics:**
- Frame: Brass
- Button: Bronze
- Sealing Assembly: Beryllium Nickel w/Teflon
- Bulb: 3 mm dia. Glass
- Compression Screw: Bronze
- Deflector: Bronze
- Ejection Spring: Stainless Steel
- DuPont Registered Trademark

**Operation**

The glass Bulb contains a fluid that expands when exposed to heat. When the rated temperature is reached, the fluid expands sufficiently to shatter the glass Bulb, allowing the sprinkler to activate and flow water.

### Table A

**NFPA 13D AND NFPA 13R WET PIPE HYDRAULIC DESIGN CRITERIA FOR THE SERIES LFII (TY2234) RESIDENTIAL PENDENT AND RECESSED PENDENT SPRINKLERS**

<table>
<thead>
<tr>
<th>Minimum Flow (a) and Residual Pressure</th>
<th>Maximum Coverage Area (b)</th>
<th>Maximum Spacing Ft. (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>For Horizontal Ceiling (Max. 2 Inch Rise for 12 Inch Run)</td>
<td>155°F/68°C or 175°F/79°C</td>
<td>12 x 12 (3.7 x 3.7)</td>
</tr>
<tr>
<td>Up To Max. 4 Inch Rise for 12 Inch Run</td>
<td>155°F/68°C</td>
<td>14 x 14 (4.3 x 4.3)</td>
</tr>
<tr>
<td>175°F/79°C</td>
<td>16 x 16 (4.9 x 4.9)</td>
<td></td>
</tr>
<tr>
<td>175°F/68°C</td>
<td>18 x 18 (5.6 x 5.5)</td>
<td></td>
</tr>
<tr>
<td>175°F/79°C</td>
<td>20 x 20 (6.1 x 6.1)</td>
<td></td>
</tr>
</tbody>
</table>

(a) For coverage area dimensions less than or between those indicated, it is necessary to use the minimum required flow for the next highest coverage area for which hydraulic design criteria are stated.

(b) Requirement is based on minimum flow in GPM (LPM) from each sprinkler. The associated residual pressures are calculated using the nominal K-factor. Refer to Hydraulic Design Criteria Section for details.

### Design Criteria

The Series LFII (TY2234) Residential Pendent Sprinklers are UL and C-UL Listed for installation in accordance with the following criteria.

**NOTE**

When conditions exist that are outside the scope of the provided criteria, refer to the Residential Sprinkler Design Guide TFP490 for the manufacturer's recommendations that may be acceptable to the local Authority having Jurisdiction.

### System Type

Only wet pipe systems may be utilized.

**Hydraulic Design.** The minimum required sprinkler flow rate for systems designed to NFPA 13D or NFPA 13R are given in Table A as a function of temperature rating and the maximum allowable coverage areas. The sprinkler flow rate is the minimum required discharge from each of the total number of "design sprinklers" as specified in NFPA 13D or NFPA 13R.

For systems designed to NFPA 13, the number of design sprinklers is to be the four most hydraulically demanding sprinklers. The minimum required discharge from each of the four sprinklers is to be the greater of the following:

- The flow rates given in Table A for NFPA 13D and 13R as a function of temperature rating and the maximum allowable coverage area.
- A minimum discharge of 0.1 gpm/sq. ft. over the "design area" comprised of the four most hydraulically demanding sprinklers for the actual coverage areas being protected by the four sprinklers.

### Obstruction To Water Distribution

Locations of sprinklers are to be in accordance with the obstruction rules of NFPA 13 for residential sprinklers.

### Operational Sensitivity

- For "Horizontal Ceilings" (maximum 2 inch rise for 12 inch run), the sprinklers are to be installed with a deflector to ceiling distance of 1-3/8 to 4 inches or in the recessed position using only the Style 20 Recessed Escutcheon as shown in Figure 2.

**NOTES**

The "Beam Ceiling Design Criteria" section starting on Page 4 permits deflector to ceiling distances up to 15-3/4 inches. So as to help avoid obstructions to water distribution, a maximum 12 inch deflector-to-ceiling distance is permitted for NFPA 13D and NFPA 13R applications where the sprinklers are located in closets.

- For "Sloped Ceilings" (greater than 2 inch rise up to 8 inch rise for 12 inch run), the sprinklers are to be installed with a deflector to ceiling...
Components:
1 - Frame
2 - Button
3 - Sealing Assembly
4 - Bulb
5 - Compression Screw
6 - Deflector *

* Temperature rating is indicated on Deflector.

7/16" (11.1 mm)
NOMINAL MAKE-IN

1/2" NPT
ESCUTCHEON PLATE SEATING SURFACE

2-7/8" DIA.
(73.0 mm)

2-1/4" (57.2 mm)
1-5/8" (41.3 mm)
WRENCH FLATS
STYLE 20 RECESSED ESCUTCHEON

CROSS SECTION
PENDENT
RECESSED PENDENT

**FIGURE 1**
SERIES LFII (TY2234) RESIDENTIAL PENDENT AND RECESSED PENDENT SPRINKLERS

---

**FIGURE 2**
STYLE 20 RECESSED ESCUTCHEON FOR USE WITH THE SERIES LFII (TY2234) RESIDENTIAL PENDENT SPRINKLER

---

distance of 1-3/8 to 4 inches or in the recessed position using only the Style 20 Recessed Escutcheon as shown in Figure 2

**Sprinkler Spacing.** The minimum spacing between sprinklers is 8 feet (2.4 m). The maximum spacing between sprinklers cannot exceed the length of the coverage area (Ref. Table A) being hydraulically calculated (e.g., maximum 12 feet for a 12 ft. x 12 ft. coverage area, or 20 feet for a 20 ft. x 20 ft. coverage area).
Beam Ceiling Design Criteria

The Series LFII (TY2234) Residential Pendent Sprinklers are UL and C-UL Listed for installation in residential occupancies with horizontal ceilings (i.e., slopes up to a 2 inch rise over a 12 inch run) with beams when installed in accordance with the following criteria:

General Information. The basic concept of this protection scheme is to locate the sprinklers on the underside of the beams, Ref. Figure 5, (not in the beam pockets); to identify the main beams that principally run in one direction as "primary beams"; and, to identify the beams that run principally perpendicular to the main beams, as may be present (or in some cases may be necessary for proper sprinkler protection), as "secondary beams".

Primary and Secondary Beam Types. Solid surface, solid or hollow core, combustible or non-combustible.

Primary and Secondary Beam Positioning. Directly attached to the underside of a combustible or non-combustible smooth ceiling at any elevation.

Primary Beam Cross-Section: Maximum depth of 14 inches and the maximum width is unlimited. The cross-sectional shape of the primary beam may be rectangular to circular.

Secondary Beam Cross-Section. Maximum depth to be no greater than the primary beam and the maximum width is unlimited. The cross-sectional shape of the secondary beam may be rectangular to circular.

Primary Beam Spacing. The primary beams (Fig. 6A) are to be 3 ft. - 4 in. to 8 ft. from the compartment wall to center of the nearest beam and from center to center between beams.

Secondary Beam Spacing. The secondary beams principally run perpendicular to the primary beams.

Secondary beams of a depth equal to the primary beam must be placed so that the beam pockets created by the primary beams do not exceed 20 feet in length (Fig. 6B).

NOTE
When the beam pockets created by the primary beams exceed 20 feet in length, the installation will require the use of secondary beams as described above. Otherwise, secondary beams need not be present.

Secondary beams of a cross-sectional depth greater than one-quarter the depth of the primary beams are to be a minimum of 3 ft. - 4 in. from the compartment wall to center of the nearest beam and from center to center between beams (Fig. 6C).

Secondary beams of a cross-sectional depth no greater than one-quarter the depth of the primary beams may be placed at any compartment wall to center of the nearest beam distance and from any center to center distance between beams (Fig. 6C).

Lintels. Lintels over doorways exiting the compartment must be present. The minimum height for the lintels is 8 inches or no less than the depth of the Primary Beams, whichever is greater.

Sprinkler Types. Series LFII (TY2234), 155F and 175F, Pendent and Recessed Pendent Residential Sprinklers.

Sprinkler Coverage Area and Hydraulic Design. The sprinkler coverage areas and hydraulic design criteria as presented in the Table A for "Horizontal Ceilings" are to be applied.

Sprinkler Position. The deflector to bottom of primary beams for the Series LFII (TY2234) Pendent Sprinklers or Series LFII (TY2234) Recessed Pendent Sprinklers is to be 1-1/4 to 1-3/4 inches (Fig. 5A). The vertical centerline of the Series LFII (TY2234) Pendent Sprinklers is to be no greater than half the primary beam cross-sectional width plus 2 inches from the centerline of the primary beam (Fig 5B).

NOTES
Core drilling of beams to allow the installation of sprinkler drops requires consulting with a structural engineer.

Where core drilling is not permitted, the previously stated sprinkler position criteria for the Series LFII (TY2234) Pendent Sprinklers allows for the sprinkler drop to be placed adjacent to the primary beam.

Beam and Soffit Arrangements. A soffit is permitted to be placed around the perimeter of a compartment with the beam arrangement within the soffited area (Fig. 7).

The cross-section of the soffit may be any size as long as it does not create an obstruction to water distribution per the obstruction rules of NFPA 13 for residential sprinklers.

When soffits are present, the previously provided 3 ft. - 4 in. to 6 ft. "compartment wall to adjacent beam" distance for the primary and secondary beams is to be measured from the face of the soffit as opposed to the compartment wall.
ALL FIGURES: DISTANCES ARE MEASURED TO COMPARTMENT WALL FACES AND TO CENTERLINES OF BEAMS

**FIGURE 6A**
PRIMARY BEAM SPANS UP TO 20'-0" (6,1 m)

**FIGURE 6B**
PRIMARY BEAM SPANS GREATER THAN 20'-0" (6,1 m)

**FIGURE 6C**
COMBINATIONS OF PRIMARY AND SECONDARY BEAMS

**FIGURE 6**
BEAM ARRANGEMENTS
*(Refer to the "Beam Ceiling Design Criteria" section)*
Installation

The Series LFII (TY2234) must be installed in accordance with the following instructions:

**NOTES**
Do not install any bulb type sprinkler if the bulb is cracked or there is a loss of liquid from the bulb. With the sprinkler held horizontally, a small air bubble should be present. The diameter of the air bubble is approximately 1/16 inch (1.6 mm).

A leak tight 1/2 inch NPT sprinkler joint should be obtained with a torque of 7 to 14 ft.lbs. (9.5 to 19.0 Nm). A maximum of 21 ft.lbs. (28.5 Nm) of torque is to be used to install sprinklers. Higher levels of torque may distort the sprinkler inlet with consequent leakage or impairment of the sprinkler.

Do not attempt to compensate for insufficient adjustment in an Escutcheon Plate by under- or over-tightening the Sprinkler. Readjust the position of the sprinkler fitting to suit.

The Series LFII Pendent Sprinklers must be installed in accordance with the following instructions.

**Step 1.** Pendent sprinklers are to be installed in the pendent position with the deflector parallel to the ceiling.

**Step 2.** With pipe thread sealant applied to the pipe threads, hand tighten the sprinkler into the sprinkler fitting.

**Step 3.** Tighten the sprinkler into the sprinkler fitting using only the W-Type 6 Sprinkler Wrench (Ref. Figure 3). With reference to Figure 1, the W-Type 6 Sprinkler Wrench is to be applied to the wrench flats.

The Series LFII Recessed Pendent Sprinklers must be installed in accordance with the following instructions.

**Step A.** Recessed pendent sprinklers are to be installed in the pendent position with the deflector parallel to the ceiling.

**Step B.** After installing the Style 20 Mounting Plate over the sprinkler threads and with pipe thread sealant applied to the pipe threads, hand tighten the sprinkler into the sprinkler fitting.

**Step C.** Tighten the sprinkler into the sprinkler fitting using only the W-Type 7 Recessed Sprinkler Wrench (Ref. Figure 4). With reference to Figure 1, the W-Type 7 Recessed Sprinkler Wrench is to be applied to the sprinkler wrench flats.

**Step D.** After the ceiling has been installed or the finish coat has been applied, slide on the Style 20 Closure over the Series LFII Sprinkler and push the Closure over the Mounting Plate until its flange comes in contact with the ceiling.

Care and Maintenance

The Series LFII (TY2234) must be maintained and serviced in accordance with the following instructions:

**NOTES**
Absence of an Escutcheon Plate may delay the sprinkler operation in a fire situation.

Before closing a fire protection system main control valve for maintenance work on the fire protection system which it controls, permission to shut down the affected fire protection system must be obtained from the proper authorities and all personnel who may be affected by this action must be notified.

Sprinklers which are found to be leaking or exhibiting visible signs of corrosion must be replaced.

Automatic sprinklers must never be painted, plated, coated, or otherwise altered after leaving the factory. Modified sprinklers must be replaced. Sprinklers that have been exposed to corrosive products of combustion, but have not operated, should be replaced if they cannot be completely cleaned by wiping the sprinkler with a cloth or by brushing it with a soft bristle brush.

Care must be exercised to avoid dam-
Limited Warranty

Products manufactured by Tyco Fire & Building Products (TFBP) are warranted solely to the original Buyer for ten (10) years against defects in material and workmanship when paid for and properly installed and maintained under normal use and service. This warranty will expire ten (10) years from date of shipment by TFBP. No warranty is given for products or components manufactured by companies not affiliated by ownership with TFBP or for products and components which have been subject to misuse, improper installation, corrosion, or which have not been installed, maintained, modified, or repaired in accordance with applicable Standards of the National Fire Protection Association, and/or the standards of any other Authorities Having Jurisdiction. Materials found by TFBP to be defective shall be either repaired or replaced, at TFBP’s sole option. TFBP neither assumes, nor authorizes any person to assume for it, any other obligation in connection with the sale of products or parts of products. TFBP shall not be responsible for sprinkler system design errors or inaccurate or incomplete information supplied by Buyer or Buyer’s representatives.

In no event shall TFBP be liable, in contract, tort, strict liability or under any other legal theory, for incidental, indirect, special or consequential damages, including but not limited to labor charges, regardless of whether TFBP was informed about the possibility of such damages, and in no event shall TFBP’s liability exceed an amount equal to the sales price.

The foregoing warranty is made in lieu of any and all other warranties, express or implied, including warranties of merchantability and fitness for a particular purpose.

This limited warranty sets forth the exclusive remedy for claims based on failure of or defect in products, materials or components, whether the claim is made in contract, tort, strict liability or any other legal theory.

This warranty will apply to the full extent permitted by law. The invalidity, in whole or part, of any portion of this warranty will not affect the remainder.

Ordering Procedure

When placing an order, indicate the full product name. Contact your local distributor for availability.

Sprinkler Assembly:

Series LFII (TY2234), K=4.9, Residential Pendent Sprinkler with (specify) temperature rating and (specify) finish, P/N (specify).

155°F/67°C or
Chrome Plated ............... P/N 51-201-9-155
White Polyester .............. P/N 51-201-4-155

175°F/79°C or
Chrome Plated ............... P/N 51-201-4-175
White Polyester .............. P/N 51-201-4-175

Recessed Escutcheon:

Specify: Style 20 Recessed Escutcheon with (specify*) finish, P/N (specify*).

*Refer to Technical Data Sheet TFP770.

Sprinkler Wrench:

Specify: W-Type 6 Sprinkler Wrench, P/N 56-000-6-387.

Specify: W-Type 7 Sprinkler Wrench, P/N 56-850-4-001.
Series LFII Residential Horizontal Sidewall Sprinklers

4.2 K-factor

General Description

The Series LFII (TY1334) Residential Horizontal Sidewall Sprinklers are decorative, fast response, frangible bulb sprinklers designed for use in residential occupancies such as homes, apartments, dormitories, and hotels. When aesthetics and optimized flow characteristics are the major consideration, the Series LFII (TY1334) should be the first choice.

The Series LFII are to be used in wet pipe residential sprinkler systems for one- and two-family dwellings and mobile homes per NFPA 13D; wet pipe residential sprinkler systems for residential occupancies up to and including four stories in height per NFPA 13R; or, wet pipe sprinkler systems for the residential portions of any occupancy per NFPA 13.

The Series LFII (TY1334) has a 4.2 (60.5) K-factor that provides the required residential flow rates at reduced pressures, enabling smaller pipe sizes and water supply requirements.

The recessed version of the Series LFII (TY1334) is intended for use in areas with finished walls. It employs a two-piece Style 20 Recessed Escutcheon. The Recessed Escutcheon provides 1/4 inch (6.4 mm) of recessed adjustment or up to 1/2 inch (12.7 mm) of total adjustment from the flush mounting surface position. The adjustment provided by the Recessed Escutcheon reduces the accuracy to which the pipe nipples to the sprinklers must be cut.

The Series LFII (TY1334) has been designed with heat sensitivity and water distribution characteristics proven to help in the control of residential fires and to improve the chance for occupants to escape or be evacuated.

WARNINGS

The Series LFII (TY1334) Residential Horizontal Sidewall Sprinklers described herein must be installed and maintained in compliance with this document, as well as with the applicable standards of the National Fire Protection Association, in addition to the standards of any other authorities having jurisdiction. Failure to do so may impair the performance of these devices.

The owner is responsible for maintaining their fire protection system and devices in proper operating condition. The installing contractor or sprinkler manufacturer should be contacted with any questions.

Sprinkler/Model Identification Number

SIN TY1334

IMPORTANT

Always refer to Technical Data Sheet TFP700 for the "INSTALLER WARNING" that provides cautions with respect to handling and installation of sprinkler systems and components. Improper handling and installation can permanently damage a sprinkler system or its components and cause the sprinkler to fail to operate in a fire situation or cause it to operate prematurely.
Components:
1 - Frame
2 - Button Assembly
3 - Sealing Assembly
4 - Bulb
5 - Compression Screw
6 - Deflector *
* Temperature rating is indicated on top of Deflector.

FIGURE 1
SERIES LFII (TY1334) RESIDENTIAL HORIZONTAL SIDEWALL AND RECESSED HORIZONTAL SIDEWALL SPRINKLERS

FIGURE 2
STYLE 20 RECESSED ESCUTCHEON FOR USE WITH THE SERIES LFII (TY1334) RESIDENTIAL HORIZONTAL SIDEWALL SPRINKLER

FIGURE 3
W-TYPE 6 SPRINKLER WRENCH

FIGURE 4
W-TYPE 7 RECESSED SPRINKLER WRENCH
Technical Data

Approvals:
UL and C-UL Listed. NYC Approved under MEA 44-03-E.

Maximum Working Pressure:
175 psi (12,1 bar)

Discharge Coefficient:
K = 4.2 GPM/psi²/2 (60,5 LPM/bar¹/2)

Temperature Rating:
155°F/68°C or 175°F/79°C

Finishes:
White Polyester Coated, Chrome Plated, or Natural Brass

Physical Characteristics:
Frame Brass
Button Bronze
Sealing Assembly Beryllium Nickel w/Teflon
Bulb 3 mm dia. Glass
Compression Screw Bronze
Deflector Copper

†Dupont Registered Trademark

Operation
The glass bulb contains a fluid that expands when exposed to heat. When the rated temperature is reached, the fluid expands sufficiently to shatter the glass bulb allowing the sprinkler to activate and flow water.

Design Criteria
The Series LFII (TY1334) Residential Horizontal Sidewall Sprinklers are UL and C-UL Listed for installation in accordance with the following criteria.

NOTE
When conditions exist that are outside the scope of the provided criteria, refer to the Residential Sprinkler Design Guide TFP490 for the manufacturer's recommendations that may be acceptable to the local Authority Having Jurisdiction.

System Type. Only wet pipe systems may be utilized.

Hydraulic Design. The minimum required sprinkler flow rate for systems designed to NFPA 13D or NFPA 13R are given in Table A, B, C, and D as a function of temperature rating and the maximum allowable coverage areas. The sprinkler flow rate is the minimum required discharge from each of the total number of "design sprinklers" as specified in NFPA 13D or NFPA 13R. For systems designed to NFPA 13, the number of design sprinklers is to be the four most hydraulically demanding sprinklers. The minimum required discharge from each of the four sprinklers is to be the greater of the following:

- The flow rates given in Tables A, B, C, and D for NFPA 13D and 13R as a function of temperature rating and the maximum allowable coverage area.
- A minimum discharge of 0.1 gpm/sq. ft. over the "design area" comprised of the four most hydraulically demanding sprinklers for the actual coverage areas being protected by the four sprinklers.

Obstruction To Water Distribution. Locations of sprinklers are to be in accordance with the obstruction rules of NFPA 13 for residential sprinklers.

Operational Sensitivity. The sprinklers are to be installed with an end-of-deflector-boss to wall distance of 1-3/8 to 6 inches or in the recessed position using only the Style 20 Recessed Escutcheon as shown in Figure 2. In addition the top-of-deflector-to-ceiling distance is to be within the range (Ref. Table A, B, C, or D) being hydraulically calculated.

Sprinkler Spacing. The minimum spacing between sprinklers is 8 feet (2.4 m). The maximum spacing between sprinklers cannot exceed the width of the coverage area (Ref. Table A) being hydraulically calculated (e.g., maximum 12 feet for a 12 ft. x 12 ft. coverage area, or 16 feet for a 16 ft. x 20 ft. coverage area).

Installation
The Series LFII (TY1334) must be installed in accordance with the following instructions:

NOTES
Do not install any bulb type sprinkler if the bulb is cracked or there is a loss of liquid from the bulb. With the sprinkler held horizontally, a small air bubble should be present. The diameter of the air bubble is approximately 1/16 inch (1.5 mm).

A leak tight 1/2 inch NPT sprinkler joint should be obtained with a torque of 7 to 14 ft.lbs. (9,5 to 19,0 Nm). A maximum of 21 ft.lbs. (28,5 Nm) of torque is to be used to install sprinklers. Higher levels of torque may distort the sprinkler inlet with consequent leakage or impairment of the sprinkler.
## ELEVATION

**TABLE A**

**NFPA 13D AND NFPA 13R WET PIPE HYDRAULIC DESIGN CRITERIA**

**FOR THE SERIES LFII (TY1334)**

**RESIDENTIAL HORIZONTAL SIDEWALL AND RECESSED HORIZONTAL SIDEWALL SPRINKLERS**

**FOR HORIZONTAL CEILING (Maximum 2 Inch Rise for 12 Inch Run)**

<table>
<thead>
<tr>
<th>Maximum Coverage Area (a) Width x Length (b) Ft. x Ft. (m x m)</th>
<th>Maximum Spacing Ft. (m)</th>
<th>Minimum Flow (c) and Residual Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Top-Of-Deflector-To-Ceiling:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>4 to 6 Inches (100 to 150 mm)</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>155°F/68°C</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 GPM (45.4 LPM)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8.2 psi (0.57 bar)</td>
</tr>
<tr>
<td>12 x 12 (3.7 x 3.7)</td>
<td>12 (3.7)</td>
<td>12 GPM (45.4 LPM)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8.2 psi (0.57 bar)</td>
</tr>
<tr>
<td>14 x 14 (4.3 x 4.3)</td>
<td>14 (4.3)</td>
<td>14 GPM (53.0 LPM)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11.1 psi (0.77 bar)</td>
</tr>
<tr>
<td>16 x 16 (4.9 x 4.9)</td>
<td>16 (4.9)</td>
<td>16 GPM (60.6 LPM)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14.5 psi (1.00 bar)</td>
</tr>
<tr>
<td>16 x 18 (4.9 x 5.5)</td>
<td>16 (4.9)</td>
<td>19 GPM (71.9 LPM)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20.5 psi (1.41 bar)</td>
</tr>
<tr>
<td>16 x 20 (4.9 x 6.1)</td>
<td>16 (4.9)</td>
<td>23 GPM (87.1 LPM)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30.0 psi (2.07 bar)</td>
</tr>
</tbody>
</table>

|                                                               |                          | **175°F/79°C**                          |
|                                                               |                          | 13 GPM (49.2 LPM)                       |
|                                                               |                          | 9.6 psi (0.66 bar)                      |
| 12 x 12 (3.7 x 3.7)                                          | 12 (3.7)                 | 13 GPM (49.2 LPM)                       |
|                                                               |                          | 9.6 psi (0.66 bar)                      |
| 14 x 14 (4.3 x 4.3)                                          | 14 (4.3)                 | 16 GPM (60.6 LPM)                       |
|                                                               |                          | 14.5 psi (1.00 bar)                     |
| 16 x 16 (4.9 x 4.9)                                          | 16 (4.9)                 | 18 GPM (68.1 LPM)                       |
|                                                               |                          | 18.4 psi (1.27 bar)                     |
| 16 x 18 (4.9 x 5.5)                                          | 16 (4.9)                 | 21 GPM (79.5 LPM)                       |
|                                                               |                          | 25.0 psi (1.72 bar)                     |
| 16 x 20 (4.9 x 6.1)                                          | 16 (4.9)                 | 26 GPM (98.4 LPM)                       |
|                                                               |                          | 38.3 psi (2.64 bar)                     |

|                                                               |                          | **Top-Of-Deflector-To-Ceiling:**       |
|                                                               |                          | **6 to 12 Inches (150 to 300 mm)**     |
|                                                               |                          | **155°F/68°C**                          |
|                                                               |                          | 13 GPM (49.2 LPM)                       |
|                                                               |                          | 9.6 psi (0.66 bar)                      |
| 12 x 12 (3.7 x 3.7)                                          | 12 (3.7)                 | 13 GPM (49.2 LPM)                       |
|                                                               |                          | 9.6 psi (0.66 bar)                      |
| 14 x 14 (4.3 x 4.3)                                          | 14 (4.3)                 | 17 GPM (64.3 LPM)                       |
|                                                               |                          | 16.4 psi (1.13 bar)                     |
| 16 x 16 (4.9 x 4.9)                                          | 16 (4.9)                 | 18 GPM (68.1 LPM)                       |
|                                                               |                          | 18.4 psi (1.27 bar)                     |
| 16 x 18 (4.9 x 5.5)                                          | 16 (4.9)                 | 21 GPM (79.5 LPM)                       |
|                                                               |                          | 25.0 psi (1.72 bar)                     |
| 16 x 20 (4.9 x 6.1)                                          | 16 (4.9)                 | 26 GPM (98.4 LPM)                       |
|                                                               |                          | 38.3 psi (2.64 bar)                     |

|                                                               |                          | **175°F/79°C**                          |
|                                                               |                          | 18 GPM (68.1 LPM)                       |
|                                                               |                          | 18.4 psi (1.27 bar)                     |
| 12 x 12 (3.7 x 3.7)                                          | 12 (3.7)                 | 18 GPM (68.1 LPM)                       |
|                                                               |                          | 18.4 psi (1.27 bar)                     |
| 14 x 14 (4.3 x 4.3)                                          | 14 (4.3)                 | 18 GPM (68.1 LPM)                       |
|                                                               |                          | 18.4 psi (1.27 bar)                     |
| 16 x 16 (4.9 x 4.9)                                          | 16 (4.9)                 | 18 GPM (68.1 LPM)                       |
|                                                               |                          | 18.4 psi (1.27 bar)                     |
| 16 x 18 (4.9 x 5.5)                                          | 16 (4.9)                 | 21 GPM (79.5 LPM)                       |
|                                                               |                          | 25.0 psi (1.72 bar)                     |
| 16 x 20 (4.9 x 6.1)                                          | 16 (4.9)                 | 26 GPM (98.4 LPM)                       |
|                                                               |                          | 38.3 psi (2.64 bar)                     |

(a) For coverage area dimensions less than or between those indicated, it is necessary to use the minimum required flow for the next highest coverage area for which hydraulic design criteria are stated.

(b) Width (backwall where sprinkler is located) x Length (horizontal throw of sprinkler).

(c) Requirement is based on minimum flow in GPM (LPM) from each sprinkler. The associated residual pressures are calculated using the nominal K-factor. Refer to Hydraulic Design Criteria Section for details.

(d) Sidewall sprinklers, where installed under a ceiling with a slope greater than 0 inch rise for a 12 inch run to a slope up to 2 inch rise for 12 inch run, must be located per one of the following:

- Locate the sprinklers at the high point of the slope and positioned to discharge down the slope.
- Locate the sprinklers along the slope and positioned to discharge across the slope.
(a) For coverage area dimensions less than or between those indicated, it is necessary to use the minimum required flow for the next highest coverage area for which hydraulic design criteria are stated.

(b) Width (backwall where sprinkler is located) x Length (horizontal throw of sprinkler).

(c) Requirement is based on minimum flow in GPM (LPM) from each sprinkler. The associated residual pressures are calculated using the nominal K-factor. Refer to Hydraulic Design Criteria Section for details.

**TABLE B**

**NFPA 13D AND NFPA 13R WET PIPE HYDRAULIC DESIGN CRITERIA FOR THE SERIES LFII (TY1334)**

**RESIDENTIAL HORIZONTAL SIDEWALL AND RECESSED HORIZONTAL SIDEWALL SPRINKLERS FOR SPRINKLERS AT THE HIGH POINT OF THE SLOPE AND DISCHARGING DOWN THE SLOPE (Greater Than 2 Inch Rise for 12 Inch Run Up To 8 Inch Rise for 12 Inch Run)**
### Table C

**NFPA 13D AND NFPA 13R WET PIPE HYDRAULIC DESIGN CRITERIA**

**FOR THE SERIES LFII (TY1334)**

**RESIDENTIAL HORIZONTAL SIDEWALL AND RECESSED HORIZONTAL SIDEWALL SPRINKLERS**

**FOR SPRINKLERS LOCATED ALONG A SLOPE AND DISCHARGING ACROSS THE SLOPE**

(Greater Than 2 Inch Rise for 12 Inch Run Up To 4 Inch Rise for 12 Inch Run)

<table>
<thead>
<tr>
<th>Top-Of-Deflector- To- Ceiling: 4 to 6 Inches (100 to 150 mm)</th>
<th>Top-Of-Deflector- To- Ceiling: 6 to 12 Inches (150 to 300 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>155°F/68°C</td>
<td>175°F/79°C</td>
</tr>
<tr>
<td>12 x 12</td>
<td>16 GPM (60.6 LPM)</td>
</tr>
<tr>
<td>(3.7 x 3.7)</td>
<td>14.5 psi (1.00 bar)</td>
</tr>
<tr>
<td>14 x 14</td>
<td>16 GPM (60.6 LPM)</td>
</tr>
<tr>
<td>(4.3 x 4.3)</td>
<td>14.5 psi (1.00 bar)</td>
</tr>
<tr>
<td>16 x 16</td>
<td>16 GPM (60.6 LPM)</td>
</tr>
<tr>
<td>(4.9 x 4.9)</td>
<td>14.5 psi (1.00 bar)</td>
</tr>
<tr>
<td>16 x 18</td>
<td>22 GPM (83.3 LPM)</td>
</tr>
<tr>
<td>(4.9 x 5.5)</td>
<td>27.4 psi (1.89 bar)</td>
</tr>
<tr>
<td>16 x 20</td>
<td>23 GPM (87.1 LPM)</td>
</tr>
<tr>
<td>(4.9 x 6.1)</td>
<td>30.0 psi (2.07 bar)</td>
</tr>
</tbody>
</table>

(a) For coverage area dimensions less than or between those indicated, it is necessary to use the minimum required flow for the next highest coverage area for which hydraulic design criteria are stated.

(b) Width (backwall where sprinkler is located) x Length (horizontal throw of sprinkler).

(c) Requirement is based on minimum flow in GPM (LPM) from each sprinkler. The associated residual pressures are calculated using the nominal K-factor. Refer to Hydraulic Design Criteria Section for details.
(a) For coverage area dimensions less than or between those indicated, it is necessary to use the minimum required flow for the next highest coverage area for which hydraulic design criteria are stated.

(b) Width (backwall where sprinkler is located) x Length (horizontal throw of sprinkler).

(c) Requirement is based on minimum flow in GPM (LPM) from each sprinkler. The associated residual pressures are calculated using the nominal K-factor. Refer to Hydraulic Design Criteria Section for details.

**TABLE D**

Care and Maintenance

The Series LFII (TY1334) must be maintained and serviced in accordance with the following instructions:

**NOTES**
Absence of an Escutcheon Plate may delay the sprinkler operation in a fire situation.

Before closing a fire protection system main control valve for maintenance work on the fire protection system which it controls, permission to shut down the affected fire protection system must be obtained from the proper authorities and all personnel who may be affected by this action must be notified.

Sprinklers which are found to be leaking or exhibiting visible signs of corrosion must be replaced.

Automatic sprinklers must never be painted, plated, coated, or otherwise altered after leaving the factory. Modified sprinklers must be replaced. Sprinklers that have been exposed to corrosive products of combustion, but have not operated, should be replaced if they cannot be completely cleaned by wiping the sprinkler with a cloth or by brushing it with a soft bristle brush.

Care must be exercised to avoid damage to the sprinklers - before, during, and after installation. Sprinklers damaged by dropping, striking, wrench twist/slippage, or the like, must be replaced. Also, replace any sprinkler that has a cracked bulb or that has lost liquid from its bulb. (Ref. Installation Section).

The owner is responsible for the inspection, testing, and maintenance of their fire protection system and devices in compliance with this document, as well as with the applicable standards of the National Fire Protection Association (e.g., NFPA 25), in addition to the standards of any other authorities having jurisdiction. The installing contractor or sprinkler manufacturer should be contacted relative to any questions.

**NOTE**
The owner must assure that the sprinklers are not used for hanging of any objects and that the sprinklers are only cleaned by means of gently dusting with a feather duster; otherwise, non-operation in the event of a fire or inadvertent operation may result.

It is recommended that automatic sprinkler systems be inspected, tested, and maintained by a qualified inspection Service in accordance with local requirements and/or national codes.

Limited Warranty

Products manufactured by Tyco Fire & Building Products (TFBP) are warranted solely to the original Buyer for ten (10) years against defects in material and workmanship when paid for and properly installed and maintained under normal use and service. This warranty will expire ten (10) years from date of shipment by TFBP. No warranty is given for products or components manufactured by companies not affiliated by ownership with TFBP or for products and components which have been subject to misuse, improper installation, corrosion, or which have not been installed, maintained, modified or repaired in accordance with applicable Standards of the National Fire Protection Association, and/or the standards of any other Authorities Having Jurisdiction. Materials found by TFBP to be defective shall be either repaired or replaced, at TFBP's sole option. TFBP neither assumes, nor authorizes any person to assume for it, any other obligation in connection with the sale of products or parts of products. TFBP shall not be responsible for sprinkler system design errors or inaccuracies.

In no event shall TFBP be liable, in contract, tort, strict liability or under any other legal theory, for incidental, indirect, special or consequential damages, including but not limited to labor charges, regardless of whether TFBP was informed about the possibility of such damages, and in no event shall TFBP's liability exceed an amount equal to the sales price.

The foregoing warranty is made in lieu of any and all other warranties, expressed or implied, including warranties of merchantability and fitness for any particular purpose.

This limited warranty sets forth the exclusive remedy for claims based on failure of or defect in products, materials or components, whether the claim is made in contract, tort, strict liability or any other legal theory.

This warranty will apply to the full extent permitted by law. The invalidity, in whole or in part, of any portion of this warranty will not affect the remainder.

Ordering Procedure

When placing an order, indicate the full product name. Contact your local distributor for availability.

**Sprinkler Assembly:**
Series LFII (TY1334), K=4.2, Residential Horizontal Sidewall Sprinkler with (specify) temperature rating and (specify) finish, P/N (specify).

- 155°F/79°C or Chrome Plated, 51-211-4-155
- 155°F/79°C White Polyester, 51-211-4-155
- 155°F/88°C White, (RAL9010)* 51-211-3-155
- 155°F/88°C Natural Brass, 51-211-1-155
- 175°F/79°C or Chrome Plated, 51-211-4-175
- 175°F/79°C White Polyester, 51-211-4-175
- 175°F/79°C White, (RAL9010)* 51-211-3-175
- 175°F/79°C Natural Brass, 51-211-1-175

*Eastern Hemisphere sales only.

**Recessed Escutcheon:**
Specify: Style 20 Recessed Escutcheon with (specify) finish, P/N (specify). *Refer to Technical Data Sheet TFP770.

**Sprinkler Wrench:**
Specify: W-Type 6 Sprinkler Wrench, P/N 56-000-6-387.

**Sprinkler Assembly:**
Specify: W-Type 7 Sprinkler Wrench, P/N 56-850-4-001.
Series TY-FRB — 2.8, 4.2, 5.6, and 8.0 K-factor
Upright, Pendent, and Recessed Pendent Sprinklers
Quick Response, Standard Coverage

General Description

The Series TY-FRB, 2.8, 4.2, 5.6, and 8.0 K-factor, Upright and Pendent Sprinklers described in this data sheet are quick response - standard coverage, decorative 3 mm glass bulb type spray sprinklers designed for use in light or ordinary hazard, commercial occupancies such as banks, hotels, shopping malls, etc.

The recessed version of the Series TY-FRB Pendent Sprinkler, where applicable, is intended for use in areas with a finished ceiling. It uses either a two-piece Style 10 (1/2 inch NPT) or Style 40 (3/4 inch NPT) Recessed Escutcheon with 1/2 inch (12.7 mm) of recessed adjustment or up to 3/4 inch (19.1 mm) of total adjustment from the flush pendent position, or a two-piece Style 20 (1/2 inch NPT) or Style 30 (3/4 inch NPT) Recessed Escutcheon with 1/4 inch (6.4 mm) of recessed adjustment or up to 1/2 inch (12.7 mm) of total adjustment from the flush pendent position. The adjustment provided by the Recessed Escutcheon reduces the accuracy to which the fixed pipe drops to the sprinklers must be cut.

Corrosion resistant coatings, where applicable, are utilized to extend the life of copper alloy sprinklers beyond that which would otherwise be obtained when exposed to corrosive atmospheres. Although corrosion resistant coated sprinklers have passed the standard corrosion tests of the applicable approval agencies, the testing is not representative of all possible corrosive atmospheres. Consequently, it is recommended that the end user be consulted with respect to the suitability of these coatings for any given corrosive environment. The effects of ambient temperature, concentration of chemicals, and gas/chemical velocity, should be considered, as a minimum, along with the corrosive nature of the chemical to which the sprinklers will be exposed.

An intermediate level versions of the Series TY-FRB Pendent Sprinklers are detailed in Technical Data Sheet TFP356, and Sprinkler Guards are detailed in Technical Data Sheet TFP780

WARNINGS

The Series TY-FRB Sprinklers described herein must be installed and maintained in compliance with this document, as well as with the applicable standards of the National Fire Protection Association, in addition to the standards of any other authorities having jurisdiction. Failure to do so may impair the performance of these devices.

The owner is responsible for maintaining their fire protection system and devices in proper operating condition. The installing contractor or sprinkler manufacturer should be contacted with any questions.

Model/Sprinkler Identification Numbers

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TY1131</td>
<td>Upright 2.8K, 1/2&quot;NPT</td>
</tr>
<tr>
<td>TY1231</td>
<td>Pendent 2.8K, 1/2&quot;NPT</td>
</tr>
<tr>
<td>TY2131</td>
<td>Upright 4.2K, 1/2&quot;NPT</td>
</tr>
<tr>
<td>TY2231</td>
<td>Pendent 4.2K, 1/2&quot;NPT</td>
</tr>
<tr>
<td>TY3131</td>
<td>Upright 5.6K, 1/2&quot;NPT</td>
</tr>
<tr>
<td>TY3231</td>
<td>Pendent 5.6K, 1/2&quot;NPT</td>
</tr>
<tr>
<td>TY4131</td>
<td>Upright 8.0K, 3/4&quot;NPT</td>
</tr>
<tr>
<td>TY4231</td>
<td>Pendent 8.0K, 3/4&quot;NPT</td>
</tr>
</tbody>
</table>

**IMPORTANT**

Always refer to Technical Data Sheet TFP700 for the "INSTALLER WARNING" that provides cautions with respect to handling and installation of sprinkler systems and components. Improper handling and installation can permanently damage a sprinkler system or its components and cause the sprinkler to fail to operate in a fire situation or cause it to operate prematurely.
## Technical Data

### Approvals
- UL and C-UL Listed. FM, LPCB, and NYC Approved. (Refer to Table A and B for complete approval information including corrosion resistant status.)

### Maximum Working Pressure
- Refer to Table C.

### Discharge Coefficient
- **K** = 2.8 GPM/psi\(^{1/2}\) (40.3 LPM/bar\(^{1/2}\))
- **K** = 4.2 GPM/psi\(^{1/2}\) (60.5 LPM/bar\(^{1/2}\))
- **K** = 5.6 GPM/psi\(^{1/2}\) (80.6 LPM/bar\(^{1/2}\))
- **K** = 8.0 GPM/psi\(^{1/2}\) (115.2 LPM/bar\(^{1/2}\))

### Temperature Ratings
- Refer to Table A and B

### Finishes
- Sprinkler: Refer to Table A and B. Recessed Escutcheon: White Coated, Chrome Plated, or Brass Plated.

### Physical Characteristics
- **Frame** ................. Bronze
- **Button** ................. Brass/Copper
- **Sealing Assembly** .... Beryllium Nickel w/Teflon
- **Bulb** .................. Glass
- **Compression Screw** .... Bronze
- **Deflector** .............. Copper/Brass
- **Bushing (K=2.8)** ....... Bronze

### Operation
- The glass Bulb contains a fluid which expands when exposed to heat. When the rated temperature is reached, the fluid expands sufficiently to shatter the glass Bulb, allowing the sprinkler to activate and water to flow.

### Design Criteria
- The Series TY-FRB Pendent and Upright Sprinklers are intended for fire protection systems designed in accordance with the standard installation rules recognized by the applicable Listing or Approval agency (e.g., UL Listing is based on the requirements of NFPA 13, and FM Approval is based on the requirements of FM’s Loss Prevention Data Sheets). Only the Style 10, 20, 30, or 40 Recessed Escutcheon, as applicable, is to be used for recessed pendant installations.

---

### SPRINKLER FINISH (See Note 7)

<table>
<thead>
<tr>
<th>K</th>
<th>TYPE</th>
<th>TEMP.</th>
<th>BULB LIQUID</th>
<th>NATURAL BRASS</th>
<th>CHROME PLATED</th>
<th>WHITE*** POLYESTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.8</td>
<td>PENDENT (TY1231)</td>
<td>135°F/57°C</td>
<td>Orange</td>
<td></td>
<td></td>
<td>1, 2, 3, 5</td>
</tr>
<tr>
<td></td>
<td>and UPRIGHT (TY1131)</td>
<td>155°F/68°C</td>
<td>Red</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>175°F/79°C</td>
<td>Yellow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>200°F/93°C</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>4.2</td>
<td>PENDENT (TY2231)</td>
<td>135°F/57°C</td>
<td>Orange</td>
<td></td>
<td></td>
<td>1, 2</td>
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<tr>
<td></td>
<td>and UPRIGHT (TY2131)</td>
<td>155°F/68°C</td>
<td>Red</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>175°F/79°C</td>
<td>Yellow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>200°F/93°C</td>
<td>Green</td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td>286°F/141°C</td>
<td>Blue</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### NOTES:
- 1. Listed by Underwriters Laboratories, Inc. (UL) as Quick Response Sprinklers.
- 2. Listed by Underwriters Laboratories, Inc. for use in Canada (C-UL) as Quick Response Sprinklers.
- 3. Approved by Factory Mutual Research Corporation (FM) as Quick Response Sprinklers.
- 4. Approved by the City of New York under MEA 354-01-E.
- 5. Installing Sprinklers are noted to be UL and C-UL Listed, listed as Corrosion Resistant Sprinklers.
- * Installed with Style 10 (1/2" NPT) or Style 40 (3/4" NPT) 3/4" Total Adjustment
- ** Recessed Escutcheon, as applicable.
- *** Frame and Deflector only. Listings and approvals apply to color (Special Order).
- N/A: Not Available

### LABORATORY LISTINGS AND APPROVALS

**TABLE A**

**2.8 AND 4.2 K-FACTOR SPRINKLERS**
<table>
<thead>
<tr>
<th>K</th>
<th>TYPE</th>
<th>TEMP.</th>
<th>BULB LIQUID</th>
<th>NATURAL BRASS</th>
<th>CHROME PLATED</th>
<th>WHITE*** POLYESTER</th>
<th>LEAD COATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.5</td>
<td>PENDENT (TY3231) and UPRIGHT (TY3131)</td>
<td>135°F/57°C</td>
<td>Orange</td>
<td>1, 2, 3, 4, 5, 6, 7</td>
<td>1, 2, 3, 5</td>
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<td></td>
<td></td>
<td>155°F/68°C</td>
<td>Red</td>
<td></td>
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<td></td>
<td>175°F/79°C</td>
<td>Yellow</td>
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</tr>
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<td>200°F/93°C</td>
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</tr>
<tr>
<td>8.0</td>
<td>PENDENT (TY4231) and UPRIGHT (TY4131)</td>
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<td></td>
<td></td>
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<td>N/A</td>
</tr>
<tr>
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<td></td>
<td>175°F/79°C</td>
<td>Yellow</td>
<td></td>
<td></td>
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</tr>
<tr>
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<td></td>
<td>200°F/93°C</td>
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<td></td>
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<tr>
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<td>286°F/141°C</td>
<td>Blue</td>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>

NOTES:
1. Listed by Underwriters Laboratories, Inc. (UL) as Quick Response Sprinklers.
2. Listed by Underwriters Laboratories, Inc. for use in Canada (C-UL) as Quick Response Sprinklers.
3. Approved by Factory Mutual Research Corporation (FM) as Quick Response Sprinklers.
4. Approved by the Loss Prevention Certification Board (LPCB Ref. No. 007k/04) as Quick Response Sprinklers; however, the LPCB does not rate the thermal sensitivity of recessed sprinklers.
5. Approved by the City of New York under MEA 354-01-E.
6. VdS Approved (For details contact Tyco Fire & Building Products, Enschede, Netherlands, Tel. 31-53-428-4444/Fax 31-53-428-3377).
7. Approved by the Loss Prevention Certification Board (LPCB Ref. No. 094a/06) as Quick Response Sprinklers.
8. Where Polyester Coated and Lead Coated Sprinklers are noted to be UL and C-UL Listed, the sprinklers are UL and C-UL Listed as Corrosion Resistant Sprinklers. Where Lead Coated Sprinklers are noted to be FM Approved, the sprinklers are FM Approved as a Corrosion Resistant Sprinklers.

* Installed with Style 10 (1/2" NPT) or Style 40 (3/4" NPT) 3/4" Total Adjustment Recessed Escutcheon, as applicable.
** Installed with Style 20 (1/2" NPT) or Style 30 (3/4" NPT) 1/2" Total Adjustment Recessed Escutcheon, as applicable.
*** Frame and Deflector only. Listings and approvals apply to color (Special Order).
N/A: Not Available

**TABLE B**
LABORATORY LISTINGS AND APPROVALS
5.6 AND 8.0 K-FACTOR SPRINKLERS
**SPRINKLER FINISH**

<table>
<thead>
<tr>
<th>K</th>
<th>TYPE</th>
<th>NATURAL BRASS</th>
<th>CHROME PLATED</th>
<th>WHITE POLYESTER</th>
<th>LEAD COATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.8</td>
<td>PENDENT (TY3231) and UPRIGHT (TY3131)</td>
<td>175 PSI (12,1 BAR)</td>
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<td></td>
<td>N/A</td>
</tr>
<tr>
<td>1/2&quot; NPT</td>
<td>RECESSED PENDENT (TY323)</td>
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<td>4.2</td>
<td>PENDENT (TY4231) and UPRIGHT (TY4131)</td>
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<td>5.6</td>
<td>PENDENT (TY3231) and UPRIGHT (TY3131)</td>
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<td>OR</td>
<td>175 PSI (12,1 BAR)</td>
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<td>8.0</td>
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**NOTES:**

1. The maximum working pressure of 250 psi (17.2 bar) only applies to the Listing by Underwriters Laboratories Inc. (UL); the Listing by Underwriters Laboratories, Inc. for use in Canada (C-UL); and, the Approval by the City of New York.

### TABLE C, MAXIMUM WORKING PRESSURE

**Installation**

The Series TY-FRB Sprinklers must be installed in accordance with the following instructions:

**NOTES**

Do not install any bulb type sprinkler if the bulb is cracked or there is a loss of liquid from the bulb. With the sprinkler held horizontally, a small air bubble should be present. The diameter of the air bubble is approximately 1/16 inch (1.6 mm) for the 135°F/57°C to 3/32 inch (2.4 mm) for the 286°F/141°C temperature ratings.

A leak tight 1/2 inch NPT sprinkler joint should be obtained with a torque of 7 to 14 ft.lbs. (9.5 to 19.0 Nm). A maximum of 21 ft.lbs. (28.5 Nm) of torque may be used to install sprinklers with 1/2 NPT connections. A leak tight 3/4 inch NPT sprinkler joint should be obtained with a torque of 10 to 20 ft.lbs. (13.4 to 26.8 Nm). A maximum of 30 ft.lbs. (40.7 Nm) of torque is to be used to install sprinklers with 3/4 NPT connections. Higher levels of torque may distort the sprinkler inlet and cause leakage or impairment of the sprinkler.

Do not attempt to make-up for insufficient adjustment in the escutcheon plate by under- or over-lightening the sprinkler. Readjust the position of the sprinkler fitting to suit.

The Series TY-FRB Pendent and Upright Sprinklers must be installed in accordance with the following instructions.

**Step 1.** Pendent sprinklers are to be installed in the pendent position, and upright sprinklers are to be installed in the upright position.

**Step 2.** With pipe thread sealant applied to the pipe threads, hand tighten the sprinkler into the sprinkler fitting.

**Step 3.** Tighten the sprinkler into the sprinkler fitting using only the W-Type 6 Sprinkler Wrench (Ref. Figure 13). With reference to Figures 1, 2, 3, and 4, the W-Type 6 Sprinkler Wrench is to be applied to the sprinkler wrench flats.

The Series TY-FRB Recessed Pendent Sprinklers must be installed in accordance with the following instructions.

**Step A.** After installing the Style 10, 20, 30, or 40 Mounting Plate, as applicable, over the sprinkler threads and with pipe thread sealant applied to the pipe threads, hand tighten the sprinkler into the sprinkler fitting.

**Step B.** Tighten the sprinkler into the sprinkler fitting using only the W-Type 7 Recessed Sprinkler Wrench (Ref. Figure 14). With reference to Figure 1, 2, 3, and 4, the W-Type 7 Recessed Sprinkler Wrench is to be applied to the sprinkler wrench flats.

**Step C.** After the ceiling has been installed or the finish coat has been applied, slide on the Style 10, 20, 30, or 40 Closure over the Series TY-FRB Sprinkler and push the Closure over the Mounting Plate until its flange comes in contact with the ceiling.
Care and Maintenance

The Series TY-FRB Sprinklers must be maintained and serviced in accordance with the following instructions:

NOTES
Before closing a fire protection system main control valve for maintenance work on the fire protection system that it controls, permission to shut down the affected fire protection system must be obtained from the proper authorities and all personnel who may be affected by this action must be notified.

The owner must assure that the sprinklers are not used for hanging of any objects; otherwise, non-operation in the event of a fire or inadvertent operation may result.

Absence of an escutcheon, which is used to cover a clearance hole, may delay the time to sprinkler operation in a fire situation.

Sprinklers that are found to be leaking or exhibiting visible signs of corrosion must be replaced.

Automatic sprinklers must never be painted, plated, coated or otherwise altered after leaving the factory. Modified sprinklers must be replaced. Sprinklers that have been exposed to corrosive products of combustion, but have not operated, should be replaced if they cannot be completely cleaned by wiping the sprinkler with a cloth or by brushing it with a soft bristle brush.

Care must be exercised to avoid damage to the sprinklers - before, during, and after installation. Sprinklers damaged by dropping, striking, wrench twisting/slipage, or the like, must be replaced. Also, replace any sprinkler that has a cracked bulb or that has lost liquid from its bulb. (Ref. Installation Section).

Frequent visual inspections are recommended to be initially performed for corrosion resistant coated sprinklers, after the installation has been completed, to verify the integrity of the corrosion resistant coating. Thereafter, annual inspections per NFPA 25 should suffice; however, instead of inspecting from the floor level, a random
sampling of close-up visual inspections should be made, so as to better determine the exact sprinkler condition and the long term integrity of the corrosion resistant coating, as it may be affected by the corrosive conditions present.

The owner is responsible for the inspection, testing, and maintenance of their fire protection system and devices in compliance with this document, as well as with the applicable standards of the National Fire Protection Association (e.g., NFPA 25), in addition to the standards of any other authorities having jurisdiction. The installing contractor or sprinkler manufacturer should be contacted relative to any questions.

It is recommended that automatic sprinkler systems be inspected, tested, and maintained by a qualified Inspection Service in accordance with local requirements and/or national codes.
PART NUMBER SELECTION
SERIES TY-FRB PENDENT AND UPRIGHT SPRINKLERS

<table>
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<tr>
<th>MODEL/SIN</th>
<th>SPRINKLER</th>
<th>TEMPERATURE RATING</th>
</tr>
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<tr>
<td>330 2.8K UPRIGHT (1/2&quot;NPT)</td>
<td>1 NATURAL BRASS</td>
<td>135 135°F/57°C</td>
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<tr>
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<tr>
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<td>175 175°F/79°C</td>
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<td>286 286°F/141°C</td>
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<tr>
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<td>4 WHITE POLYESTER</td>
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<td>341 4.2K PENDENT (1/2&quot;NPT)</td>
<td>3 WHITE (RAL9010)*</td>
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</tr>
<tr>
<td>371 5.6K PENDENT (1/2&quot;NPT)</td>
<td>9 CHROME PLATED</td>
<td></td>
</tr>
<tr>
<td>391 8.0K PENDENT (3/4&quot;NPT)</td>
<td>7 LEAD COATED</td>
<td></td>
</tr>
</tbody>
</table>

* Eastern Hemisphere sales only.

**Limited Warranty**

Products manufactured by Tyco Fire & Building Products (TFBP) are warranted solely to the original Buyer for ten (10) years against defects in material and workmanship when paid for and properly installed and maintained under normal use and service. This warranty will expire ten (10) years from date of shipment by TFBP. No warranty is given for products or components manufactured by companies not affiliated with ownership with TFBP or for products and components which have been subject to misuse, improper installation, corrosion, or which have not been installed, maintained, modified or repaired in accordance with applicable Standards of the National Fire Protection Association, and/or the standards of any other Authorities Having Jurisdiction. Materials found by TFBP to be defective shall be either repaired or replaced, at TFBP's sole option. TFBP neither assumes, nor authorizes any person to assume for it, any other obligation in connection with the sale of products or parts of products. TFBP shall not be responsible for sprinkler system design errors or inaccurate or incomplete information supplied by Buyer or Buyer's representatives.

In no event shall TFBP be liable, in contract, tort, strict liability or under any other legal theory, for incidental, indirect, special or consequential damages, including but not limited to labor charges, regardless of whether TFBP was informed about the possibility of such damages, and in no event shall TFBP's liability exceed an amount equal to the sales price.

The foregoing warranty is made in lieu of any and all other warranties express or implied, including warranties of merchantability and fitness for a particular purpose.

This limited warranty sets forth the exclusive remedy for claims based on failure of or defect in products, materials or components, whether the claim is made in contract, tort, strict liability or any other legal theory. This warranty will apply to the full extent permitted by law. The invalidity, in whole or part, of any portion of this warranty will not affect the remainder.

**Ordering Procedure**

When placing an order, indicate the full product name. Refer to the Price List for complete listing of Part Numbers.

Contact your local distributor for availability.

**Sprinkler Assemblies with NPT Thread Connections:**
Specify: (Specify Model/SIN), Quick Response, (specify K-factor), (specify temperature rating), Series TY-FRB (specify Pendent or Upright) Sprinkler with (specify type of finish or coating), P/N (specify from Table D).

**Recessed Escutcheon:**
Specify: Style (10, 20, 30, or 40) Recessed Escutcheon with (specify*) finish, P/N (specify*).

* Refer to Technical Data Sheet TFP770.

**Sprinkler Wrench:**
Specify: W-Type 6 Sprinkler Wrench, P/N 56-000-6-387.
Specify: W-Type 7 Sprinkler Wrench, P/N 56-850-4-001.
BlazeMaster®
CPVC Fire Sprinkler Pipe & Fittings
Submittal Sheet

General Description
Tyco Fire & Building Products (TFBP) BlazeMaster CPVC Pipe and Fittings are designed exclusively for use in wet pipe automatic fire sprinkler systems. They are made from a specially developed thermoplastic compound composed of post chlorinated polyvinyl chloride (CPVC) resin and state of the art additives. TFBP BlazeMaster CPVC products are easier to install than traditional steel pipe systems, and at the same time, provide superior heat resistance and strength as compared to traditional CPVC and PVC piping materials used in the plumbing trade. Various adapters are available to connect CPVC pipe to metallic piping. All female pipe thread adapters have brass inserts for durability. Grooved adapters connect directly to grooved end valves and metallic pipe, with flexible grooved end couplings.

Technical Data
Sizes
3/4" to 3"

Maximum Working Pressure
175 psi

Approvals
UL, FM, CUL, NSF, Dade County, LPCB, MEA, and the City of Los Angeles. (Refer to IH-1900, Rev. 0, January 2005 "Installation Instruction & Technical Handbook" for exact listing/approval information.)

Manufacture Source
U.S.A.

Material
• Pipe: ASTM F442, SDR 13.5
• Fittings: ASTM F438 (Sch. 40) and ASTM F439 (Sch. 80), ASTM F1970

Color
Orange

WARNING
Tyco Fire & Building Products (TFBP) BlazeMaster CPVC Pipe and Fittings described herein must be installed and maintained in compliance with this document, as well as with the applicable standards of the National Fire Protection Association, in addition to the standards of any other authorities having jurisdiction. Failure to do so may impair the performance of these devices.

The owner is responsible for maintaining their fire protection system and devices in proper operating condition. The installing contractor or sprinkler manufacturer should be contacted with any questions.
### Installation

Tyco Fire and Building Products (TFBP) BlazeMaster CPVC Pipe and Fittings are to be installed in accordance with IH-1900, Rev. 0, January 2005 "Installation Instruction & Technical Handbook".

### Care and Maintenance

The owner is responsible for the inspection, testing, and maintenance of their fire protection system and devices in compliance with this document, as well as with the applicable standards of the National Fire Protection Association (e.g., NFPA 25), in addition to the standards of any authority having jurisdiction. The installing contractor or product manufacturer should be contacted relative to any questions.

It is recommended that automatic sprinkler systems be inspected, tested, and maintained by a qualified Inspection Service in accordance with local requirements and/or national codes.

#### NOTES

*Before closing a fire protection system control valve for inspection or maintenance work on the fire protection system that it controls, permission to shut down the affected fire protection system must first be obtained from the proper authorities and all personnel who may be affected by this action must be notified.*

*After placing a fire protection system in service, notify the proper authorities and advise those responsible for monitoring proprietary and/or central station alarms.*

---

<table>
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<th>NOMINAL SIZE</th>
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<th>AVERAGE I.D.</th>
<th>WEIGHT lbs./ft.</th>
<th>WATER FILLED WEIGHT lbs./ft.</th>
<th>FT. OF PIPE PER LIFT</th>
<th>WEIGHT PER LIFT lbs.</th>
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**FIGURE 1 — PIPE DIMENSIONS**
FIGURE 2 — FITTING DIMENSIONS (Part 1 of 4)
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<td>2-1/2&quot; x 76,1 mm Groove</td>
<td>2-5/16&quot;</td>
<td>76,1 mm (3.000&quot;)</td>
<td>80</td>
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</tbody>
</table>

**FIGURE 2 — FITTING DIMENSIONS (Part 2 of 4)**
<table>
<thead>
<tr>
<th>FITTING TYPE</th>
<th>PART NUMBER</th>
<th>NOMINAL SIZE</th>
<th>NOMINAL TAKE-OUT (T/O)</th>
<th>SCHED.</th>
<th>WEIGHT (lb.)</th>
</tr>
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<tbody>
<tr>
<td>SPRINKLER HEAD ADAPTER</td>
<td>80175E</td>
<td>3/4&quot; x 1/2&quot; NPT</td>
<td>7/16&quot;</td>
<td>80</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td>80176E</td>
<td>1&quot; x 1/2&quot; NPT</td>
<td>7/16&quot;</td>
<td>80</td>
<td>0.22</td>
</tr>
<tr>
<td></td>
<td>80175WL</td>
<td>3/4&quot; x 1/2&quot; NPT</td>
<td>7/16&quot;</td>
<td>40</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td>80179</td>
<td>1&quot; x 3/4&quot; NPT</td>
<td>13/16&quot;</td>
<td>40</td>
<td>0.43</td>
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<td>1/2&quot;</td>
<td>40</td>
<td>0.19</td>
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<tr>
<td></td>
<td>80176W</td>
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<td>1/2&quot;</td>
<td>40</td>
<td>0.18</td>
</tr>
<tr>
<td>SPRINKLER HEAD ADAPTER (SPIGOT)</td>
<td>80177L</td>
<td>3/4&quot; x 1/2&quot; NPT</td>
<td>1/2&quot;</td>
<td>40</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td>80179</td>
<td>1&quot; x 1/2&quot; NPT</td>
<td>9/16&quot;</td>
<td>40</td>
<td>0.20</td>
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<tr>
<td></td>
<td>80180</td>
<td>1&quot; x 3/4&quot; NPT</td>
<td>7/8&quot;</td>
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<td>0.40</td>
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<tr>
<td>FEMALE ADAPTER</td>
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<td>13/16&quot;</td>
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<td>80145</td>
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<td>7/8&quot;</td>
<td>40</td>
<td>0.63</td>
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<td>80146</td>
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</tr>
<tr>
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<td>80147</td>
<td>1-1/2&quot; x 1-1/2&quot; NPT</td>
<td>1-3/8&quot;</td>
<td>80</td>
<td>1.42</td>
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<tr>
<td></td>
<td>80148</td>
<td>2&quot; x 2&quot; NPT</td>
<td>1-11/16&quot;</td>
<td>80</td>
<td>2.66</td>
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<tr>
<td>MALE ADAPTER</td>
<td>80157</td>
<td>3/4&quot; x 3/4&quot; NPT</td>
<td>1-5/16&quot;</td>
<td>40</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>80158</td>
<td>1&quot; x 1&quot; NPT</td>
<td>1-3/8&quot;</td>
<td>40</td>
<td>0.58</td>
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</table>

<table>
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<tr>
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<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>80250</td>
<td>3/4&quot; x 3/4&quot; x 1/2&quot; NPT</td>
<td>9/16&quot;</td>
<td>9/16&quot;</td>
</tr>
<tr>
<td>80251</td>
<td>1&quot; x 1&quot; x 1/2&quot; NPT</td>
<td>11/16&quot;</td>
<td>11/16&quot;</td>
</tr>
<tr>
<td>80249</td>
<td>1&quot; x 1&quot; x 1&quot; NPT</td>
<td>15/16&quot;</td>
<td>15/16&quot;</td>
</tr>
<tr>
<td>80256</td>
<td>1-1/4&quot; x 1&quot; x 1/2&quot; NPT</td>
<td>7/16&quot;</td>
<td>9/16&quot;</td>
</tr>
<tr>
<td>80252</td>
<td>1-1/4&quot; x 1-1/4&quot; x 1/2&quot; NPT</td>
<td>7/16&quot;</td>
<td>7/16&quot;</td>
</tr>
<tr>
<td>80257</td>
<td>1-1/2&quot; x 1-1/4&quot; x 1/2&quot; NPT</td>
<td>1&quot;</td>
<td>11/16&quot;</td>
</tr>
<tr>
<td>80254</td>
<td>1-1/2&quot; x 1-1/2&quot; x 1/2&quot; NPT</td>
<td>1&quot;</td>
<td>12&quot;</td>
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<tr>
<td>80256</td>
<td>2&quot; x 1-1/2&quot; x 1/2&quot; NPT</td>
<td>1/2&quot;</td>
<td>5/8&quot;</td>
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<td>80253</td>
<td>2&quot; x 2&quot; x 1/2&quot; NPT</td>
<td>1/2&quot;</td>
<td>1/2&quot;</td>
</tr>
</tbody>
</table>

**FIGURE 2 — FITTING DIMENSIONS (Part 3 of 4)**
## Limited Warranty

Products manufactured by Tyco Fire & Building Products (TFBP) are warranted solely to the original Buyer for ten (10) years against defects in material and workmanship when paid for and properly installed and maintained under normal use and service. This warranty will expire ten (10) years from date of shipment by TFBP. No warranty is given for products or components manufactured by companies not affiliated by ownership with TFBP or for products and components which have been subject to misuse, improper installation, corrosion, or which have not been installed, maintained, modified or repaired in accordance with applicable Standards of the National Fire Protection Association, and/or the standards of any other Authorities Having Jurisdiction. Materials found by TFBP to be defective shall be either repaired or replaced, at TFBP's sole option. TFBP neither assumes, nor authorizes any person to assume for it, any other obligation in connection with the sale of products or parts of products. TFBP shall not be responsible for sprinkler system design errors or inaccurate or incomplete information supplied by Buyer or Buyer's representatives.

In no event shall TFBP be liable, in contract, tort, strict liability or under any other legal theory, for incidental, indirect, special or consequential damages, including but not limited to labor charges, regardless of whether TFBP was informed about the possibility of such damages, and in no event shall TFBP's liability exceed an amount equal to the sales price.

The foregoing warranty is made in lieu of any and all other warranties, express or implied, including warranties of merchantability and fitness for a particular purpose.

This limited warranty sets forth the exclusive remedy for claims based on failure of or defect in products, materials or components, whether the claim is made in contract, tort, strict liability or any other legal theory.

This warranty will apply to the full extent permitted by law. The invalidity, in whole or part, of any portion of this warranty will not affect the remainder.
Riser Manifold
Figure 513, 513D/513R

Commercial
- NFPA 13 Systems
Floor Control
- High Rises
Residential
- NFPA 13D/13R Systems

Tyco Fire Products — www.tyco-grooved.com
451 North Cannon Avenue, Lansdale, Pennsylvania 19446 — USA
Customer Service/Sales: Tel: (215) 362-0700 / Fax: (215) 362-5385
Technical Services: Tel: (800) 381-9312 / Fax: (800) 791-5500

General Description

The threaded ends of the 1" and 1½" bodies, the threaded by grooved ends of the 2" bodies, and the grooved ends of the 1½" - 6" bodies allow for an easy transition to either check or control valves. The exclusive and dedicated flow switch designed for the manifolds has been tested and Listed for use in this specific configuration by Underwriters Laboratories, Underwriters Laboratories of Canada and Factory Mutual.

Installation is simplified with one convenient take-out for the 1" and 1½" threaded and 1½" grooved versions, as well as one take-out for the 2" threaded by grooved and the grooved sizes 2" - 6".

The Riser Manifold is approved for installation in either the horizontal or the vertical position. The optional relief valve assembly is available for locations which require relief valves on gridded systems.

Riser Manifolds for use in Canada only are provided with a Water Flow Switch that has a Tamper Switch mounted inside for cover removal detection.

Technical Data

Figure: 513 (commercial)
513D (residential)
513D/513R (residential)

Styles: Threaded or Grooved
Sizes: 1", 1½", 2", 2½", 3", 4" and 6"
Approvals: UL, FM, and ULC

Maximum Working Pressure: 175 psi

Standard Finish: Painted
Optional Accessories:
Pressure Relief Valve Kit (see page 7)
Approximate Trimmed Weight - 7.5 lbs. (3.4Kg.)
The width of the Riser Manifold is approximately 3½".

Note: Items 7 & 8 are used on Manifolds for use in Canada Only.
Approximate Trimmed Weight - 11.2 lbs. (5.1Kg.)

The width of the Riser Manifold is approximately 3½".

Note: Items 16 & 17 are used on Manifolds for use in Canada Only.

Figures 2 and 3 - Bill of Material

<table>
<thead>
<tr>
<th>Detail No.</th>
<th>Description</th>
<th>No. Req'd</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Manifold Body M x F</td>
<td>1</td>
<td>976-339-01</td>
</tr>
<tr>
<td>2</td>
<td>Potter Waterflow Switch # VSR-SF w/ ½&quot; Paddle</td>
<td>1</td>
<td>H-416-02</td>
</tr>
<tr>
<td>3</td>
<td>½&quot; Ball Valve F101</td>
<td>0</td>
<td>971-116-03</td>
</tr>
<tr>
<td>4</td>
<td>½&quot; x ½&quot; x ½&quot; Reducing Tee</td>
<td>1</td>
<td>H-469-100-050-100</td>
</tr>
<tr>
<td>5</td>
<td>½&quot; Insp. Test &amp; Drain Valve F202 w/ ½&quot; Test Orifice</td>
<td>1</td>
<td>971-122-04</td>
</tr>
<tr>
<td>6</td>
<td>Sight Glass M x F</td>
<td>1</td>
<td>971-118-01</td>
</tr>
<tr>
<td>7</td>
<td>¾&quot; Water Pressure Gauge</td>
<td>1</td>
<td>H-418-100</td>
</tr>
<tr>
<td>7a</td>
<td>¾&quot; Water Pressure Gauge</td>
<td>0</td>
<td>971-118-02</td>
</tr>
<tr>
<td>8</td>
<td>¾&quot; Pipe Plug</td>
<td>1</td>
<td>H450-025-000</td>
</tr>
<tr>
<td>9</td>
<td>¾&quot; 3-Way Globe Valve</td>
<td>1</td>
<td>971-119-01</td>
</tr>
<tr>
<td>10</td>
<td>¾&quot; x 3&quot; Nipple</td>
<td>1</td>
<td>H-459-025-30</td>
</tr>
<tr>
<td>11</td>
<td>½&quot; x ½&quot; x ½&quot; California Tee</td>
<td>0</td>
<td>976-385-01</td>
</tr>
<tr>
<td>12</td>
<td>½&quot; Pipe Plug</td>
<td>1</td>
<td>H450-050-000</td>
</tr>
<tr>
<td>13</td>
<td>½&quot; Close Nipple</td>
<td>0</td>
<td>H-474-16</td>
</tr>
<tr>
<td>14</td>
<td>½&quot; Ball Valve</td>
<td>1</td>
<td>971-121-01</td>
</tr>
<tr>
<td>15</td>
<td>1½&quot; Close Nipple</td>
<td>1</td>
<td>H-474-24</td>
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<tr>
<td>16</td>
<td>Tamper Switch (ULC only)</td>
<td>1</td>
<td>H-419-01</td>
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<tr>
<td>17</td>
<td>Label (ULC only)</td>
<td>1</td>
<td>975-343-01</td>
</tr>
</tbody>
</table>
Figure 4

1½" Grooved Commercial Riser Manifold - Figure 513
For optional pressure relief valve, see Figure 10 (page 7)

Approximate Trimmed Weight - 11.2 lbs. (5.1Kg.)
The width of the Riser Manifold is approximately 3½".

Note: Items 12 & 13 are used on Manifolds for use in Canada Only.

Figure 4 - Bill of Material
1½" Grooved Commercial Riser Manifold

<table>
<thead>
<tr>
<th>Detail No.</th>
<th>Description</th>
<th>No. Req'd</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Manifold Body G x G</td>
<td>1</td>
<td>976-399-02</td>
</tr>
<tr>
<td>2</td>
<td>Potter Waterflow Switch # VSR-SF w/ 1½&quot; Paddle</td>
<td>1</td>
<td>H-416-02</td>
</tr>
<tr>
<td>3</td>
<td>1&quot; Ball Valve F101</td>
<td>1</td>
<td>971-121-01</td>
</tr>
<tr>
<td>4</td>
<td>1&quot; Ins., Test &amp; Drain Valve F202 w/ 1/4&quot; Test Orifice</td>
<td>1</td>
<td>971-122-04</td>
</tr>
<tr>
<td>5</td>
<td>Sight Glass M x F</td>
<td>1</td>
<td>H-418-100</td>
</tr>
<tr>
<td>6</td>
<td>1/4&quot; Water Pressure Gauge</td>
<td>1</td>
<td>971-118-01</td>
</tr>
<tr>
<td>7</td>
<td>1/4&quot; Pipe Plug</td>
<td>1</td>
<td>H-450-025-000</td>
</tr>
<tr>
<td>8</td>
<td>1/4&quot; 3-Way Globe Valve</td>
<td>1</td>
<td>971-119-01</td>
</tr>
<tr>
<td>9</td>
<td>1/4&quot; x 3' Nipple</td>
<td>1</td>
<td>H-459-025-30</td>
</tr>
<tr>
<td>10</td>
<td>1&quot; x 1/4&quot; x 1&quot; Reducing Tee</td>
<td>1</td>
<td>H-469-100-050-100</td>
</tr>
<tr>
<td>11</td>
<td>1/4&quot; Pipe Plug</td>
<td>1</td>
<td>H-450-050-000</td>
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<tr>
<td>12</td>
<td>Tamper Switch (ULC only)</td>
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<td>H-419-01</td>
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<tr>
<td>13</td>
<td>Label (ULC only)</td>
<td>1</td>
<td>976-343-01</td>
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</table>

Approximate thread engagement.
Note: Values shown in parenthesis are in millimeters

Figure 5

2" Grooved Residential Riser Manifold
Figure 513D/513R
Reference Figures 5 and 6 Bill of Materials (page 5)
For optional pressure relief valve, see Figure 10 (page 7)

Approximate Trimmed Weight - 11.0 lbs. (5.0Kg.)
The width of the Riser Manifold is approximately 3½".

Note: Items 16 & 17 are used on Manifolds for use in Canada Only.

2" Male x Groove Body Option

*Approximate thread engagement.
Note: Values shown in parenthesis are in millimeters
Approximate Weights and Dimensions of Trimmed 2', 2½', 3', 4', and 6' Grooved Commercial Riser Manifolds

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<tr>
<th>Size</th>
<th>A Inches</th>
<th>B Inches</th>
<th>C Inches</th>
<th>D Inches</th>
<th>Approx. Width Inches</th>
<th>Weight Lbs. Kg.</th>
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<td>2</td>
<td>20.00</td>
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<td>95.3</td>
<td>493.0</td>
<td>235.0</td>
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<td>2½</td>
<td>20.00</td>
<td>508.0</td>
<td>95.3</td>
<td>493.0</td>
<td>235.0</td>
<td>182.3</td>
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<td>3</td>
<td>18.13</td>
<td>460.4</td>
<td>47.6</td>
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<td>4</td>
<td>18.13</td>
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</table>

*Approximate thread engagement.
**13' is the take-out for all sizes 2' through 6'
Note: Values shown in parenthesis are in millimeters

Figure 5 and 6 - Bill of Material

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Description</th>
<th>No. Req'd</th>
<th>Part Number</th>
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<tbody>
<tr>
<td>1</td>
<td>2' Manifold Body Groove x Groove</td>
<td>1976-254-01</td>
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<td>2</td>
<td>2½' Manifold Body Groove x Groove</td>
<td>1976-254-02</td>
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<tr>
<td>3</td>
<td>3' Manifold Body Groove x Groove</td>
<td>1976-254-03</td>
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<tr>
<td>4</td>
<td>4' Manifold Body Groove x Groove</td>
<td>1976-254-04</td>
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<tr>
<td>5</td>
<td>6' Manifold Body Groove x Groove</td>
<td>1976-254-05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1a</td>
<td>2' Manifold Body Male x Groove</td>
<td>1976-411-01</td>
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<tr>
<td>1b</td>
<td>Potter Waterflow Switch VSC w/ 2' Paddle</td>
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<tr>
<td>1c</td>
<td>Potter Waterflow Switch VSC w/ 2½' Paddle</td>
<td>1976-357-02</td>
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<tr>
<td>1d</td>
<td>Potter Waterflow Switch VSC w/ 3' Paddle</td>
<td>1976-357-03</td>
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<tr>
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<td>Potter Waterflow Switch VSC w/ 4' Paddle</td>
<td>1976-357-04</td>
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<tr>
<td>1f</td>
<td>Potter Waterflow Switch VSC w/ 6' Paddle</td>
<td>1976-357-05</td>
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<tr>
<td>2</td>
<td>1' Ball Valve F101 (2')</td>
<td>1971-121-01</td>
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<tr>
<td>3</td>
<td>1½' Ball Valve F101 (2½' and 3')</td>
<td>1971-121-02</td>
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<tr>
<td>4</td>
<td>2' Ball Valve F101 (4' and 6')</td>
<td>1971-121-03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>1' Insp. Test &amp; Drain Valve F202 (2') w/ ½' Test Orifice</td>
<td>1971-122-04</td>
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<tr>
<td>19</td>
<td>1½' Insp. Test &amp; Drain Valve F202 (2½' and 3') w/ ½' Test Orifice</td>
<td>1971-122-05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>2' Insp. Test &amp; Drain Valve F202 (4' and 6') w/ ½' Test Orifice</td>
<td>1971-122-06</td>
<td></td>
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</tr>
<tr>
<td>1</td>
<td>1' Sight Glass (2')</td>
<td>H-418-100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1' Sight Glass (2½' and 3')</td>
<td>H-418-125</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2' Sight Glass (4' and 6')</td>
<td>H-418-200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1' Water Pressure Gauge</td>
<td>1971-118-01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>14' Pipe Plug</td>
<td>H-459-025-000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>1½' 3-Way Globe Valve</td>
<td>1971-119-01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>2½' x 3' Nipple</td>
<td>H-459-025-30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>1' Pipe Plug</td>
<td>H-450-100-000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>1' x 3½' x 1' Reducing Tee (2&quot;)</td>
<td>H-469-100-050-100</td>
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</tr>
<tr>
<td>10</td>
<td>1½' x 1½' x 1' Reducing Tee (4&quot; and 6&quot;)</td>
<td>H-469-200-050-200</td>
<td></td>
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<tr>
<td>11</td>
<td>2½' Pipe Plug</td>
<td>H-450-050-000</td>
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<tr>
<td>12</td>
<td>1' Ball Valve F101</td>
<td>1971-116-01</td>
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<tr>
<td>13</td>
<td>1½' Close Nipple</td>
<td>H-474-16</td>
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<td>14</td>
<td>3-Way Globe Valve</td>
<td>1971-385-01</td>
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<td></td>
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<tr>
<td>15</td>
<td>Tamper Switch (ULC only)</td>
<td>H-419-01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Label (ULC only)</td>
<td>1976-343-01</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Items 16 & 17 are used on Manifolds for use in Canada Only.
Caution: An uninsulated section of a single conductor is not permitted to be looped around the terminal and serve as two separate connections. The wire must be severed to serve as two separate connections, thereby providing supervision of the connection in the event that the wire becomes dislodged from the terminal.

Note:
For supervised circuits, see "Switch Terminal Connections" and caution note (above). The Model VSC and Model VSR-SF have two switches, one can be used to operate a central station, proprietary or remote signaling unit, while the other contact is used to operate a local audible or visual annunciator.

Testing:
The frequency of testing for the Model VSC and Model VSR-SF and their associated protective monitoring system should be in accordance with applicable NFPA Standards and/or the Authority Having Jurisdiction, but under no circumstances less than bimonthly.

Installation for Models VSC and VSR-SF: Remove the one retard assembly mounting screw. Place the switch assembly over the retard mounting tab. Replace the screw.
Relief Valve is factory set at 175psi (nonadjustable).

Note: If the optional pressure relief kit is desired for Figures 3 and 4, an outlet on the riser must be provided, and the connection and material between the riser and the manifold will need to be supplied and fabricated by the installer.

Optional Pressure Relief Valve Kit

<table>
<thead>
<tr>
<th>Detail No.</th>
<th>No. Req'd</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>H-475-050-038</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>H-476-01</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>976-419-01</td>
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<td>4</td>
<td>1</td>
<td>976-419-02</td>
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<tr>
<td></td>
<td></td>
<td>976-419-03</td>
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</tbody>
</table>

**Part Numbers**

- **M** = Male N.P.T.
- **F** = Female N.P.T.
- **G** = Grooved Connection

Optional Figure 513 Pressure Relief Valve Kit

<table>
<thead>
<tr>
<th>Size</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot;</td>
<td>4063</td>
</tr>
<tr>
<td>2½&quot; and 3&quot;</td>
<td>4072</td>
</tr>
<tr>
<td>4&quot; and 6&quot;</td>
<td>4073</td>
</tr>
</tbody>
</table>
Ordering Procedure

Ordering Information: When placing an order, indicate the full product name. Please specify the quantity, figure number, style, and size. (see page 7 for figure and part numbers)

Availability and Service: Grooved Piping Products, valves, accessories and other products are available throughout the U.S., Canada, and internationally, through a network distribution centers. You may write directly or call 215-362-0700 for the distributor nearest you.

Limited Warranty

Products manufactured by Tyco Fire Products are warranted solely to the original Buyer for ten (10) years against defects in material and workmanship when paid for and properly installed and maintained under normal use and service. This warranty will expire ten (10) years from date of shipment by Tyco Fire Products. No warranty is given for products or components manufactured by companies not affiliated by ownership with Tyco Fire Products or for products and components which have been subject to misuse, improper installation, corrosion, or which have not been installed, maintained, modified or repaired in accordance with applicable Standards of the National Fire Protection Association (NFPA), and/or the standards of any other Authorities Having Jurisdiction. Materials found by Tyco Fire Products to be defective shall be either repaired or replaced, at Tyco Fire Products' sole option. Tyco Fire Products neither assumes, nor authorizes any person to assume for it, any other obligation in connection with the sale of products or parts of products. Tyco Fire Products shall not be responsible for sprinkler system design errors or inaccurate or incomplete information supplied by Buyer or Buyer's representatives.

IN NO EVENT SHALL TYCO FIRE PRODUCTS BE LIABLE, IN CONTRACT, TORT, STRICT LIABILITY OR UNDER ANY OTHER LEGAL THEORY, FOR INCIDENTAL, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LABOR CHARGES, REGARDLESS OF WHETHER TYCO FIRE PRODUCTS WAS INFORMED ABOUT THE POSSIBILITY OF SUCH DAMAGES, AND IN NO EVENT SHALL TYCO FIRE PRODUCTS' LIABILITY EXCEED AN AMOUNT EQUAL TO THE SALES PRICE.

THE FOREGOING WARRANTY IS MADE IN LIEU OF ANY AND ALL OTHER WARRANTIES EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

General Notes: It is the Designer's responsibility to select products suitable for the intended service and to ensure that pressure ratings and performance data is not exceeded. Always read and understand the installation instructions (IH-1000). Never remove any piping component nor correct or modify any piping deficiencies without first depressurizing and draining the system. Material and gasket selection should be verified to be compatible for the specific application.

tyco/Flow Control/Tyco Fire Products

Standards Council Supplemental Agenda

August 3-5, 2010

Printed in U.S.A. 1-03

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Attachment 10-8-15-d

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**APPLICATION**

Designed for installation on potable water lines to protect against both backsiphonage and backpressure of contaminated water into the potable water supply. The Model 375 provides protection where a potential health hazard exists.

**STANDARDS COMPLIANCE**

(Unless otherwise noted, sizes 2 1/2" thru 10")
- ASSE® Listed 1013
- IAPMO® Listed
- CSA® Certified (2 1/2" thru 8")
- AWWA Compliant C511
- FM® Approved
- UL® Classified
- C-UL® Classified

Approved by the Foundation for Cross Connection Control and Hydraulic Research at the University of Southern California

**MATERIALS**

- **Main valve body**: Ductile Iron ASTM A 536 Grade 4
- **Access covers**: NORYL™, NSF Listed
- **Coatings**: FDA Approved fusion epoxy finish
- **Internals**: Stainless steel, 300 Series
- **Seal rings**: Stainless Steel, 300 Series
- **Springs**: Stainless Steel, braided hose
- **EPDM (FDA approved)**
- **Nitrile (FDA approved)**

**FEATURES**

- **Sizes**: 2 1/2" - 10"
- **Maximum working water pressure**: 175 PSI
- **Maximum working water temperature**: 140°F
- **Hydrostatic test pressure**: 350 PSI
- **End connections**: (Grooved for steel pipe) AWWA C606

**OPTIONS**

- **Suffixes can be combined**
- **- with NRS shut-off valves (standard)**
- **FS - with cast iron wye type strainer (flanged only)**
- **FSC - with epoxy coated wye type strainer (flanged only)**
- **G - with groove end gate valves**
- **GF - with grooved inlet gate connection and flanged outlet gate connection**
- **FG - with flanged inlet gate connection and grooved outlet gate connection**
- **L - less shut-off valves (flanged body connections)**
- **MS - with Integral Relief Valve Monitor Switch**
- **OSY - with OS & Y gate valves**
- **PI - with Post Indicator Gate Valve**

**ACCESSORIES**

- **Repair kit (rubber only)**
- **Thermal expansion tank (Model WXTP)**
- **Os & Y Gate valve tamper switch (OSY-40)**
- **Air gap (Model AG)**
- **Electronic Solenoid Timer (Model EST)**
- **QT-SET Quick Test Fitting Set**
- **Test Cock Lock (Model TCL24)**

**DIMENSIONS & WEIGHTS (do not include pkg.)**

<table>
<thead>
<tr>
<th>MODEL SIZE</th>
<th>A</th>
<th>B LESS GATE VALVES</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
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<tr>
<td></td>
<td>in</td>
<td>mm</td>
<td>in</td>
<td>mm</td>
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<td>mm</td>
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<tr>
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<td>317</td>
<td>78</td>
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<td>321</td>
<td>83</td>
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<td>416</td>
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<td>6</td>
<td>150</td>
<td>634</td>
<td>95</td>
<td>225</td>
<td>29</td>
<td>225</td>
<td>403</td>
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<td>8</td>
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<td>924</td>
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**DIMENSIONS & WEIGHTS (Model 375OSYG shown above)**

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<th>D</th>
<th>E</th>
<th>F</th>
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<td>1026</td>
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<td>83</td>
<td>213</td>
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<td>237</td>
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<td>237</td>
<td>403</td>
<td>1026</td>
</tr>
</tbody>
</table>

**Attachment 10-8-15-d**

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TYPICAL INSTALLATION
Local codes shall govern installation requirements. Unless otherwise specified, the assembly shall be mounted at a minimum of 12" (305mm) and a maximum of 30" (762mm) above adequate drains with sufficient side clearance for testing and maintenance. The installation shall be made so that no part of the unit can be submerged.

SPECIFICATIONS
The Reduced Pressure Principle Backflow Prevention Assembly shall be ASSE® Listed 1013, and supplied with full port gate valves. The main body and access cover shall be epoxy coated ductile iron (ASTMA 536 Grade 4), the seat ring and check valve shall be NORYL™, the stem shall be stainless steel (ASTMA276) and the seat elastomers shall be EPDM. The checks and the relief valve shall be accessible for maintenance without removing the device from the line. The Reduced Pressure Principle Backflow Prevention Assembly shall be a WILKINS Model 375.
FIRE-X-TROL®

FPT Series, Fire Protection Expansion Tanks (ASME)
175 PSIG Working Pressure

In-Line Models

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<tr>
<td></td>
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<td>mm ins.</td>
<td>mm ins.</td>
<td>size</td>
<td>kg lbs.</td>
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<tr>
<td>FPT-5-C</td>
<td>15</td>
<td>264</td>
<td>10%</td>
<td>NPTF</td>
<td>9.5</td>
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<tr>
<td>FPT-12-C</td>
<td>24</td>
<td>6.4</td>
<td>15%</td>
<td>NPTF</td>
<td>15.4</td>
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Stand Models

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<td></td>
<td>Lit. Gal.</td>
<td>mm ins.</td>
<td>mm ins.</td>
<td>mm ins.</td>
<td>size</td>
<td>kg lbs.</td>
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<tr>
<td>FPT-20V-C</td>
<td>30</td>
<td>495</td>
<td>19%</td>
<td>273</td>
<td>10% NPTF</td>
<td>23.6</td>
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<tr>
<td>FPT-30V-C</td>
<td>53</td>
<td>486</td>
<td>19%</td>
<td>324</td>
<td>12% NPTF</td>
<td>44</td>
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<tr>
<td>FPT-42V-C</td>
<td>66</td>
<td>619</td>
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<td>324</td>
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<td>FPT-60V-C</td>
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<td>938</td>
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<td>FPT-70V-C</td>
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<td>1054</td>
<td>41%</td>
<td>334</td>
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<td>FPT-90V-C</td>
<td>200</td>
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<td>16% NPTF</td>
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<td>FPT-120V-C</td>
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<td>55%</td>
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Maximum Operating Conditions

Operating Temperature: -20°F (-29°C) to 200°F (93°C)
Working Pressure: 175 PSIG (12 bar)

Specifications

<table>
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<tr>
<th>Description</th>
<th>Standard Construction</th>
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<tbody>
<tr>
<td>Standard Factory Pre-charge</td>
<td>25 PSIG (1.7 bar)</td>
</tr>
<tr>
<td>System Connection</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Diaphragm Material</td>
<td>High-Performance Rubber Compound</td>
</tr>
<tr>
<td>Liner Material</td>
<td>Polypropylene</td>
</tr>
<tr>
<td>Shell</td>
<td>Steel</td>
</tr>
<tr>
<td>Coating</td>
<td>FPT Red</td>
</tr>
<tr>
<td>Fluid Compatibility</td>
<td>With or Without Antifreeze Per NFPA 13</td>
</tr>
</tbody>
</table>

Job Name ____________________________
Location _____________________________
Contractor __________________________
Contractor P.O. No. ____________________
Sales Representative _________________
Engineer ____________________________

Submittal data sheets can ONLY be ordered as a "Submittal Data Sheet Pack", using MC# 4400. They are not available to order on an individual basis, however each data sheet is available on the Amstron Web Site and can be downloaded and printed for use as needed.
October 9, 2009

VIA EMAIL

Robert Bena
Deputy Chief
Town of Truckee Fire District

Re: Henness Flats Apts., Truckee, CA

Dear Mr. Bena:

Please be advised that we have received verbal notification from Armstrong Forensic Laboratory that the samples tested contain glycerin at a percentage of 71.3. We will forward the report as soon as it is received.

Very truly yours,

GORDON & REES LLP

DICTATED BUT NOT READ

Charles S. Custer

cc: Clay McReynolds via E-mail
TO
CHUCK THOMAS, ASST. FIRE MARSHALL
TRUCKEE FIRE PROTECTION DISTRICT
OF NEVADA COUNTY

FROM
DARIN A. NUGENT

DATE
SEPTEMBER 4, 2009

TO
CHUCK THOMAS, ASST. FIRE MARSHALL
TRUCKEE FIRE PROTECTION DISTRICT
OF NEVADA COUNTY

PHONE
530-582-7850

FAX
530-582-7757

IT #
2397

MATTER #
TYCU.00015

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If you experience any problems, please call 816.474.6550 extension 19544.

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September 4, 2009

VIA FACSIMILE – 530-582-7757
AND U.S. MAIL

Chuck Thomas, Asst. Fire Marshal
Truckee Fire Protection District of Nevada County
10049 Donner Pass Road
P.O. Box 2768
Truckee, CA 96150

Re: Henness Flats Apartments

Dear Marshal Thomas:

The following will respond to your August 20, 2009 request to SimplexGrinnell, LP ("SimplexGrinnell") for information as a part of your investigation of a fire that occurred on August 18, 2009 at 11907 Prosser Dam Road, Building 6, Truckee, California. In answer to your request, SimplexGrinnell states as follows:

1. Name of product used as antifreeze used for fire sprinkler system of listed address.
   Glycerine.

2. Percent of concentration of product by volume used for antifreeze in fire sprinkler system of listed address.
   50% water solution.

3. All MSDS sheets regarding product used for anti-freeze in the fire sprinkler system of listed address. This would include information regarding the manufacturer of product.

Please see enclosed MSDS sheets.

Very truly yours,

Darin A. Nugent

DAN:blw
MATERIAL SAFETY DATA SHEET

GLYCERINE, NATURAL  99.5% USP

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Material Identity
Product Name: GLYCERINE, NATURAL  99.5% USP
Product Code: 3455097
General or Generic ID: POLYOL

Company
Ashland
Ashland Distribution Co.,
Ashland Specialty Chemical Co.
F. O. Box 2219
Columbus, OH 43216
614-766-3333

Emergency Telephone Number:
1-800-ASHLAND (1-800-274-5255)
24 hours everyday

Regulatory Information Number:
1-800-325-3751

2. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Ingredient(s)</th>
<th>CAS Number</th>
<th>% (by weight)</th>
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<tbody>
<tr>
<td>GLYCERINE</td>
<td>56-81-5</td>
<td>100.0</td>
</tr>
</tbody>
</table>

3. HAZARDS IDENTIFICATION

Potential Health Effects
Eye
May cause mild eye irritation. Symptoms include stinging, tearing, and redness.

Skin
May cause mild skin irritation. Prolonged or repeated contact may dry the skin. Symptoms may include redness, burning, drying, and cracking of skin, and skin burns.

Swallowing
Swallowing small amounts of this material during normal handling is not likely to cause harmful effects. Swallowing large amounts may be harmful.

Inhalation
Breathing of vapor or mist is possible.

Symptoms of Exposure
Signs and symptoms of exposure to this material through breathing, swallowing, and/or passage of the material through the skin may include: stomach or intestinal upset (nausea, vomiting, diarrhea), irritation (nose, throat, airways).

Target Organ Effects
No data

Developmental Information
No data

Continued on next page
4. FIRST AID MEASURES

Eyes
If symptoms develop, move individual away from exposure and into fresh air. Flush eyes gently with water while holding eyelids apart. If symptoms persist or there is any visual difficulty, seek medical attention.

Skin
Remove contaminated clothing. Wash exposed area with soap and water. If symptoms persist, seek medical attention. Launder clothing before reuse.

Swallowing
Seek medical attention. If individual is drowsy or unconscious, do not give anything by mouth—place individual on the left side with the head down. Contact a physician, medical facility, or poison control center for advice about whether to induce vomiting. If possible, do not leave individual unattended.

Inhalation
If symptoms develop, move individual away from exposure and into fresh air. If symptoms persist, seek medical attention. If breathing is difficult, administer oxygen. Keep person warm and quiet; seek immediate medical attention.

Note to Physicians
Preexisting disorders of the following organs (or organ systems) may be aggravated by exposure to this material: skin, lung (for example, asthma-like conditions).

5. FIRE FIGHTING MEASURES

Flash Point
395.0 °F (196.8 °C) PHCC

Explosive Limit
Not applicable

Autoignition Temperature
No data

Hazardous Products of Combustion
May form: acrolein, carbon dioxide and carbon monoxide.

Continued on next page
MATERIAL SAFETY DATA SHEET

Ashland

GLYCERINE, NATURAL 99.5% USP

Fire and Explosion Hazards
No special fire hazards are known to be associated with this product.

Extinguishing Media
alcohol foam, water fog, carbon dioxide, dry chemical.

Fire Fighting Instructions
Water or foam may cause frothing which can be violent and possibly endanger the life of the firefighter. Wear a self-contained breathing apparatus with a full facepiece operated in the positive pressure demand mode with appropriate turn-out gear and chemical-resistant personal protective equipment. Refer to the personal protective equipment section of this MSDS.

NFPA Rating
Health - 1, Flammability - 1, Reactivity - 0

6. ACCIDENTAL RELEASE MEASURES

Small Spill
Absorb liquid on vermiculite, floor absorbent, or other absorbent material and transfer to hood.

Large Spill
Persons not wearing protective equipment should be excluded from area of spill until clean-up has been completed. Stop spill at source, dike area of spill to prevent spreading, pump liquid to salvage tank. Remaining liquid may be taken up on sand, clay, earth, floor absorbent, or other absorbent material and shoveled into containers.

7. HANDLING AND STORAGE

Handling
Containers of this material may be hazardous when emptied. Since emptied containers retain product residues (vapor, liquid, and/or solid), all hazard precautions given in the data sheet must be observed. Warning. Sudden release of hot organic chemical vapors or mist from process equipment operating at elevated temperature and pressure, or sudden ingress of air into vacuum equipment, may result in ignitions without the presence of obvious ignition sources. Published "autoignition" or "ignition" temperature values cannot be treated as safe operating temperatures in chemical processes without analysis of the actual process conditions. Any use of this product in elevated temperature processes should be thoroughly evaluated to establish and maintain safe operating conditions.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Eye Protection
Chemical splash goggles in compliance with OSHA regulations are advised; however, OSHA regulations also permit other type safety glasses. Consult your safety representative.

Continued on next page
MATERIAL SAFETY DATA SHEET

Ashland

GLYCERINE, NATURAL 99.5% USP

Skin Protection
Wear resistant gloves such as natural rubber. To prevent repeated or prolonged skin contact, wear impermeable clothing and boots.

Respiratory Protections
If workplace exposure limit(s) of product or any component is exceeded (see exposure guidelines), a NIOSH/MSHA approved air supplied respirator is advised in absence of proper environmental control. OSHA regulations also permit other NIOSH/MSHA respirators (negative pressure type) under specified conditions (see your industrial hygienist). Engineering or administrative controls should be implemented to reduce exposure.

Engineering Controls
Provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below TLV(s).

Exposure Guidelines

Component

GLYCERINE (56-61-5)
OSHA VPEL 5.000 mg/m3 - TWA respirable fraction
OSHA VPEL 10.000 mg/m3 - TWA total dust
ACGIH TLV 10.000 mg/m3 - TWA (total dust/particulate)

9. PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point
(For product) 554.0 F (290.0 C) @ 750 mmHg

Vapor Pressure
(For product) < 1.000 mmHg @ 68.00 F

Specific Vapor Density
3.100 @ AIR=1

Specific Gravity
1.262 @ 68.00 F

Liquid Density
10.510 lbs/gal @ 68.00 F
1.263 kg/l @ 20.00 C

Percent Volatiles
No data

Evaporation Rate
SLOWER THAN ETHYL ETHER

Appearance
No data

State
LIQUID

Continued on next page
MATERIAL SAFETY DATA SHEET

GLYCERINE, NATUREL 99.5% USP

Physical Form
HOMOGENEOUS SOLUTION

Color
CLEAR, APHA COLOR 25 MAX

Odor
No data

pH
Not applicable

10. STABILITY AND REACTIVITY

Hazardous Polymerization
Product will not undergo hazardous polymerization.

Hazardous Decomposition
May form: acrolein, carbon dioxide and carbon monoxide.

Chemical Stability
Stable.

Incompatibility
Avoid contact with: strong oxidizing agents.

11. TOXICOLOGICAL INFORMATION

No data

12. ECOLOGICAL INFORMATION

No data

13. DISPOSAL CONSIDERATION

Waste Management Information
Dispose of in accordance with all applicable local, state and federal regulations. For assistance with your waste management needs - including disposal, recycling and waste stream reduction, contact Ashland Distribution Company, IC&S Environmental Services Group at 800-637-7922.

14. TRANSPORT INFORMATION

DOT Information - 49 CFR 172.101

DOT Description:
NON-REGULATED BY D.O.T.

Continued on next page
MATERIAL SAFETY DATA SHEET

Ashland

GLYCERINE, NATURAL 99.5% USP

Container/Mode:
55 GAL DRUM/TRUCK PACKAGE

NOS Component:
None

RQ (Reportable Quantity) - 49 CFR 172.101
Not applicable

15. REGULATORY INFORMATION

US Federal Regulations

TSCA (Toxic Substances Control Act) Status
TSCA (UNITED STATES) The intentional ingredients of this product are listed.

CERCLA RQ - 40 CFR 302.4(a)
None listed

SARA 302 Components - 40 CFR 355 Appendix A
None

Section 311/312 Hazard Class - 40 CFR 370.2
Immediate( ) Delayed( ) Fire( ) Reactive( ) Sudden Release of Pressure( )

SARA 313 Components - 40 CFR 372.65
None

OSHA Process Safety Management 29 CFR 1910
None listed

EPA Accidental Release Prevention 40 CFR 68
None listed

International Regulations

Inventory Status
EINECS (EUROPE) The intentional ingredients of this product are listed.
TCCL (KOREA) The intentional ingredients of this product are listed.

State and Local Regulations

California Proposition 65
None

Pennsylvania RTK Label Information
1,2,3-PROPRANOL
55-81-5

16. OTHER INFORMATION

The information accumulated herein is believed to be accurate but is not warranted to be either originating with the company or not. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances.
A. PREPARE SEVEN (7) COPIES FOR ALL EQUIPMENT, MATERIALS. SUBMIT COPIES TO STANDARDS COUNCIL SUPPLEMENTAL AGENDA.

B. THE OWNER IS RESPONSIBLE FOR ROUTINE LHNT£. This CARRIES WITHIN THE CONTRACTOR TO COORDINATE EXACT REQUIREMENTS GOVERNED BY ACTUAL BY THESE SPECIFICATIONS AND WORK OF OTHER TRADES. IT IS THE RESPONSIBILITY AND QUITE CONTRACTOR SHALL PROVIDE LABOR, MATERIALS, AND UNION FOR ALL OTHER FITTINGS. IT IS REQUIRED FOR UNION AND CLASS 1 MATERIAL FOR ALL OTHER FITTINGS.

DO NOT USE WIRE, PLUMBING TAPE OR OTHER UNAUTHORIZED DEVICES FOR THE CONTRACTOR SHALL SAFETY HIS WORK FOR A PERIOD OF ONE YEAR. CONSTANT SUPERVISION OF THE WORK EITHER BY THE CONTRACTOR OR BY AN INDEPENDENT INSPECTOR.

CAST IRON - LOCATE HANGERS WITHIN 1" OF EACH " ST I 1/4" AND larger 2'-0" SLOPE OR AS NOM ON THE DRAWINGS.

CAST IRON - LOCATE HANGERS WITHIN 1" OF EACH " ST I 1/4" AND LARGER 2'-0" SLOPE OR AS NOM ON THE DRAWINGS.

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EVERY PERMANENT FIXTURE AND EVERY PIPE OR FITTINGS, INCLUDING BUT NOT LIMITED TO VALVES AND PIPE UNIONS, SPECIFICALLY DESIGNED FOR BRATING. ALL ACCESSORIES AND INSULATION. PROVIDE ALL REQUIRED SUBMITTAL DATA, EIN INCLUDE BUT NOT BE LIMITED TO VALVES AND PIPE UNIONS.

V. ACCESS DOOR

W. AS PER JACOBS MFG. CO. OF 2 HOUR FOR STATIC SERVICES SIMILAR IRREGULAR SURFACES WITH 0.1" THICK TAPE.

X. INSTALL PER JACOBS MFG. CO. OF 2 HOUR-FOR STATIC SERVICES SIMILAR IRREGULAR SURFACES WITH 0.1" THICK TAPE.

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QQ. INSTALL PER JACOBS MFG. CO. OF 2 HOUR-FOR STATIC SERVICES SIMILAR IRREGULAR SURFACES WITH 0.1" THICK TAPE.
48 X 58 5L

MASTER

BEDROOM + II

MASTER

BEDROOM

MASTER

BEDROOM + II

LIVING ROOM

KEY NOTES:

CD SAnTARY SEWER UP FROM 1ST FLOOR

CONNECT TO FIXTURE AS REQUIRED.

CD DRAIN UP FROM 1ST FLOOR,

CD INDIRECT WASTEFROM WATER HEATER DOWN IN CHASE TO 2ND FLOOR.

SEE SHEET FOR CONTINUATION.

CD INLET OF 1/4 PER ROOF SLOPE.

CD START TO TEE WHERE OCCURS.

CD TERMINATE TO TEE THEREBY.

UNE. TYPICAL WHERE OCCURS.

SINK.

THIS SIDE IS MIRRORED IMAGE OF LEFT.

---

APPROVED APR 29 2006

EJM ENGINEERING INC.
GENERAL NOTES:

1) PRINTS MUST BE REVIEWED FOR ACCURACY BEFORE STARTING THE JOB. PROBLEMS OR DISCREPANCIES ON THE DRAWINGS AND SPECIFICATIONS CANNOT BE GUARANTEED.

2) EVERY EFFORT HAS BEEN MADE TO COORDINATE THE LOCATIONS OF EQUIPMENT AND PIPING, IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE NEEDS GOVERNED BY ACTUAL JOB CONDITIONS. CHECK ALL INFORMATION AND REPORT ANY DISCREPANCIES BEFORE SUBMITTING-

3) INFORMATION REGARDING THE SIZE AND LOCATION OF EXISTING UTILITY(S) IS BASED ON OUR UNDERSTANDING OF THE EXISTING SYSTEMS, THERE IS NO AS-BUILT OR OVERLaid DESIGN OR PLANS AVAILABLE. EXISTING CONDITIONS AFFECT THE INSTALLATION AND SHALL BE VERIFIED BY THIS CONTRACTOR PRIOR TO BEGINNING NEW WORK.

4) INSULATION HOT WATER PIPING WITH 1/2" RUBBER OR QUALITY.

5) PROVIDE FIRE CAULKING AT APERTURES THROUGH FIRE RATING, BETWEEN FIRE AND EXISTING CONSTRUCTION, IN ANY OTHER LOCATION AS REQUIRED. SEE FIRE DRAWINGS.

KEY NOTES:

- NO WATER CONNECTION TO WATERHEATER.
- PROVIDE APARTMENT WATER SHUT OFF VALVE AND TUBE WITH LABEL "UPPER APARTMENT WATER")
- CLEARLY VISIBLE LOCATION.
- 3/8" GAS UTE IN CHIMES AND WATERHEATER.
- 1/2" GAS FURNACE AND WATERHEATER.
NOTES, PLUMBING - DRAIN SYSTEM

NOTE: MIRRORED UNITS ARE IDENTICAL WITH THE EXCEPTION OF BEING FLIPPED ALONG THE LONGITUDINAL Axis OF THE MODULE. ALL MODULES ARE DERIVATIVES OF THE TYPES 1, 1.5 FLOOR PLAN.

1. PIPE AND FITTINGS ARE SCHEDULE DWV.
2. CONNECTION OF BUILDING DRAIN OUTLETS TO INTERIOR AND THEIR CONNECTION TO BUILDING SEwer TO BE DONE AT JOB SITE BY INSTALLER.
3. OPTIONAL, HORIZONTAL DRAINAGE PIPING THAT RUNS BETWEEN FLOOR JOISTS MAY BE OMITTED AND ALL VERTICAL DRAIN PIPES STUBBED OFF AT OR NEAR BOTTOM OF FLOOR JOISTS.
4. INVERT SLOPE OF ALL VENT FITTINGS.
5. CLEANOUTS IN VERTICAL LINES MUST BE TROUABLE Fittings.
6. ALL DRAINED LINES AND FITTINGS ARE BELOW FLOOR AND ARE INSTALLED ON-SITE.
7. A CLEANOUT IS TO BE PROVIDED AT THE BASE OF ALL WASTE OR SOIL STACKS.
8. VERTICAL PIPING MUST BE SECURED AT INTERVALS TO KEEP THE PIPE IN ALIGNMENT AND CARRY THE WEIGHT OF THE PIPE AT ITS MAXIMUM CAPACITY. STACKS SHALL BE SUPPORTED AT THEIR BASE.
9. ALL HORIZONTAL PIPING SHALL BE SUPPORTED AT INTERVALS OF NOT MORE THAN FOUR (4) FEET, AT ENDS OF BRANCHES, AND AT CHANGES OF DIRECTION OR ELEVATION. TRAP ARMS IN EXCESS OF THREE (3) FEET SHALL BE SUPPORTED AS CLOSE AS POSSIBLE TO THE TRAP.

CMI ENGINEERING INC
PROPOSED APR 29 2006

CMJ ENGINEERING INC
PROPOSED APR 29 2006
NOTES, PLUMBING - DRAIN SYSTEM

0. CMJ ENGINEERING INC

1. ALL MODULES ARE DERIVATIVES OF THE TYPES I, 2, 3, 4 LEVEL 1, 2, 3, 4 FLOOR PLAN

2. CLEANOUTS ARE TO BE PROVIDED AT THE BASE OF ALL NASTIE OR SOIL STACKS.

3. VERTICAL PIPING SHALL BE SEATED AT INTERVALS TO KEEP THE PIPE IN ALIGNMENT AND CARRY THE WEIGHT OF THE PIPE AT ITS MAXIMUM CAPACITY.

4. INVERT SLOPE OF ALL VENT FITTINGS.

5. CLEANOUTS VERTICAL LINES SHALL BE THROUGH FITTINGS.

6. ALL DASHED LINES AND FITTINGS ARE BELOW FLOOR AND ARE INSTALLED ON STE.

7. A CLEANOUT IS TO BE PROVIDED AT THE BASE OF ALL NASTIE OR SOIL STACKS.

8. ALL HORIZONTAL PIPING SHALL BE SUPPORTED AT INTERVALS OF NOT MORE THAN 4 FEET, AT ENDS OF BRANCHES, AND AT CHANGES OF DIRECTION OR ELEVATION. TRAP ARMS IN EXCESS OF THREE (3) FEET SHALL BE SUPPORTED AS NEAR AS POSSIBLE TO THE TRAP.

9. HORIZONTAL DRAINAGE PIPING OF 3' OR LESS SHALL HAVE A MINIMUM SLOPE OF 1/4' PER FOOT. PIPING LARGER THAN 3' BUT LESS THAN 6' SHALL HAVE A MINIMUM SLOPE OF 1/8' PER FOOT. ALL VENT AND BRANCH VENT PIPES SHALL DRAW BACK TO THE SOIL OR NASTIE PIPE.

10. 1/4' PER FOOT SLOPE PROVIDED ON ALL HORIZONTAL BRANCHES.
Homes 04/1/06

NUMBER P3.2 CENTER

DAlE: 04/06

WG. SHEET NO.: 0

MANUFACTURING

• • •

ISSUE: FTJIIStAliER£IVE

04/06

LTR REVISION BY DATE

Guerdon

6, 8, 12PLEX

BOISE, IDAHO

NOTES:

1. PLUMBING - DRAIN SYSTEM

2. ALL PLUMBING SystemS WILL BE SUPPORTED AS ACCORDING TO THE DETAILS PROVIDED.

3. ALL PLUMBING SYSTEMS WILL BE SUPPORTED AS ACCORDING TO THE DETAILS PROVIDED.

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53. ALL PLUMBING SYSTEMS WILL BE SUPPORTED AS ACCORDING TO THE DETAILS PROVIDED.
WATER SYSTEM

COLD WATER LINES

NOTE:
10/7

WATER SYSTEM IS DESIGNED FOR PEX PIPE.
2. ALL RISERS ARE 12' TYPICAL.
3. WATER HEATER PRESSURE RELIEF VALVE TO DRAIN OUTSIDE BUILDING
4. THIS DRAWING IS NOT TO SCALE.
5. ALL VALVES ARE FULL WAY VALVES. SHUTOFF VALVES AT ALL WATER CLOSETS, LAWS, AND SINKS. MASTER VALVE AT WATER HEATER (REQUIRED)
6. ANTI-SCALD PROTECTION FOR TUBS.
7. WITH COPPER, USE LEAD-FREE SOLDER THAT WILL NOT REDUCE THE PIPE DIAMETER.
8. COPPER WATER PIPING TO BE SUPPORTED AT 48" O.C.
9. WATER HEATER WATER TEMPERATURE TO BE SET AT 120°F, CONTROLS BEHIND COVER PANEL.
10. WATER HEATER TO BE EQUIPPED WITH A DRAINCOCK.
11. DIAPHRAGM UNIONS TO BE USED AT CONNECTIONS OF WATER LINES TO WATER HEATER (NOT REQUIRED WITH IPC LINES).
12. WATER HEATER TO BE EQUIPPED WITH A SHUTOFF VALVE ABOVE FLOOR.
13. WATER INLET TO BE EQUIPPED WITH A SHUTOFF VALVE ABOVE FLOOR.
14. HP VALVE, 210°F, 125 PSI, WITH 3/4" DISCHARGE PIPE TO FLOOR TO BE RIGID PIPE.
15. BACKFLOW PREVENTION REQUIRED ON EXTERIOR HOSE BIB.
16. WATER HAMMER ARRESTORS REQUIRED WHERE NOTED.

NOTE: MIRRORED UNITS ARE IDENTICAL WITH THE EXCEPTION OF BEING FLIPPED ALONG THE LONGITUDINAL AXIS OF THE MODULE. ALL MODULES ARE DERIVATIVES OF THE TYPES 1, 2, 5 FLOOR PLAN CONFIGURATIONS.
PLUMBING - WATER SYSTEM

1. WATER HEATER WATER TEMPERATURE TO BE SET AT 120 F, CONTROLS BEHIND COVER PANEL.
2. ALL RISERS ARE 12' TYPICAL.
3. WATER HEATER PRESSURE RELIEF VALVE TO DRAIN OUTSIDE BUILDING.
4. THIS DRAWING IS NOT TO SCALE.
5. ALL VALVES ARE FULL WAY VALVES. SHUTOFF VALVES AT ALL WATER CLOSETS, LAVS, AND SINKS. MASTER VALVE AT WATER HEATER (REQUIRED).
6. ANTI-SCALD PROTECTION FOR TUB/SHOWERS.
7. WITH COPPER, USE LEAD-FREE SOLDER THAT WILL NOT REDUCE THE PIPE DIAMETER.
8. COPPER WATER PIPES TO BE SUPPORTED AT 45° D.C.
9. WATER HEATER TO BE EQUipped WITH A DRAIN COCK.
10. DIALECTIC UNIONS TO BE USED AT CONNECTIONS OF WATER LINES TO WATER HEATER (NOT REQUIRED WITH CPVC LINES).
11. WATER INLET TO BE EQUIPPED WITH A SHUTOFF VALVE.
12. WATER HEATER TO BE EQUipped WITH A SHUTOFF VALVE 30' LEFT OF FRAME.
13. 3/4" DISCHARGE PIPE OF FLOOR TO BE "R" RED PIPE.
14. BACKFLOW PREVENTION REQUIRED ON EXTERIOR HOSE BIB.
15. WATER HAMMER ARRESTORS REQUIRED WHERE NOTED.

NOTE: HOT/COLD WATER LINES TO BE COLORED CODED IN CEILING AND CRAWLSPACE AREAS.
HOT: RED
COLD: BLUE

NOTE: MIRRORED UNITS ARE IDENTICAL WITH THE EXCEPTION OF BEING FLIPPED ALONG THE LONGITUDINAL AXIS OF THE MODULE. ALL MODULES ARE DERIVATIVES OF THE TYPES 1, 2, 4, 5 FLOOR PLAN.

APPROVED: APR 28, 2006
CMJ ENGINEERING INC.
CMJ SIGN FOR 18
EXPRES APR 28, 2008
NOTE: SEE PLAN FOR PIPE SIZES AND CONNECTIONS.

SCALPS:
SLOPE VENTS TOWARDS WATER HEATER AT 1L.
PER FOOT. TYPICAL FOR ALL HDRIWAIN RUNS.

K "- T < RELIEF VALVE

EUEf DRAIN / EARTHOSS (2) PER CODE /

DRAIN BALL VALVE (1) UNOER 2ND STORY UNITS /

HEAT CONNECTION -.

CLOSED COMBUSTION WATER HEATER.

GA CONNECTION DETAIL -
Antifreeze Solutions in Home Fire Sprinkler Systems

Literature Review and Research Plan

Prepared by:
Code Consultants, Inc.
FOREWORD

Automatic sprinkler systems significantly limit the potential for loss of life and property in residential occupancies. When portions of automatic sprinkler systems must be located in spaces subject to freezing and temperatures cannot reliably be maintained at or above 40°F, NFPA 13 requires the use of dry pipe, preaction, or antifreeze sprinkler systems, or other systems specifically listed to protect against freezing. Recent fire incidents have raised questions regarding the effectiveness of sprinkler systems with certain antifreeze solutions in controlling residential fire conditions.

This report describes the results of a literature search on the impact of antifreeze solutions on the effectiveness of home fire sprinkler systems. Suggestions for further research are provided to provide a more complete analysis of currently permitted antifreeze solutions as well as to investigate other antifreeze solutions that could be used in sprinkler systems.

The content, opinions and conclusions contained in this report are solely those of the author.
Home Fire Sprinklers and Antifreeze Solutions Literature Review

Project Technical Panel

Kerry Bell
Underwriters Laboratories, Inc.

Maurice Pilette
Mechanical Designs, Inc. (chair of NFPA 13D)

Scott Franson
The Viking Corporation

Jim Lake
NFPA Staff Liaison

Pete Willse
XL GAPS

Scott Futrell
Futrell Fire Consult and Design, Inc.

Elizabeth Buc
Fire and Materials, LLC

Magnus Arvidson
SP (Sweden)

Project Sponsor

National Fire Protection Association
Literature Review and Research Plan

Antifreeze Solutions in Home Fire Sprinkler Systems

Prepared for:

The Fire Protection Research Foundation
1 Batterymarch Park
Quincy, MA 02169

Prepared by:

CODE CONSULTANTS, INC.
1804 Borman Circle Drive
Saint Louis, MO 63146

CCI Project No. 100138.04.000

May 28, 2010

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Executive Summary

NFPA 13, *Standard for the Installation of Sprinkler Systems*, has included guidance on the use of antifreeze solutions in fire sprinkler systems since the 1940 edition. Antifreeze solutions may be used in fire sprinkler systems where the piping system, or portions of the piping system, may be subject to freezing temperatures.

Two compounds, glycerin and propylene glycol, are permitted by NFPA 13 for use as antifreeze solutions with water in sprinkler systems supplied by either potable or nonpotable water connections. This report primarily address glycerin and propylene glycol antifreeze solutions, because they are the only solutions permitted by NFPA 13 for use in sprinkler systems connected to potable water supplies. Both compounds are fully miscible in water, meaning that they will form a solution with water in all proportions. Once in solution, both compounds will remain in solution and do not exhibit settling or separation from the solution.

Propylene glycol and glycerin, in pure form, are Class IIIIB Combustible Liquids having flashpoints of 210°F (99°C) and 390°F (199°C), respectively. Depending on concentration, the addition of water limits the flammability of each compound. Flashpoint, however, is not a reliable indication of the potential for ignition of a liquid when it is divided into droplets.

The potential for ignition of an antifreeze solution spray depends on the type and concentration of antifreeze as well as the size and mass concentration of the droplets. The majority of water from a standard automatic sprinkler is expected to be contained in droplets ranging from 200 to 3,000 micrometers (μm). In referenced studies, measurements of water droplets from residential sprinklers range from an arithmetic mean of 200 to over 500 μm, depending on location. However, droplets with diameters of less than 100 μm were measured. Existing data on droplet sizes expected from residential sprinklers using antifreeze solutions has not been identified; test data for large-orifice sprinklers indicates that antifreeze solutions with higher viscosities than water have little impact on the spray pattern distribution, which contradicts theoretical predictions. Future investigations should address either explicitly or implicitly the influence of antifreeze solutions on the drop size distribution produced.

Combustible liquids in a spray or mist have been found to ignite at temperatures less than their flashpoint. Research on the ignition of mists indicates that droplets of less than 10 μm behave in a similar manner to a vapor of the same concentration. Droplets larger than 40 μm may ignite at concentrations below the Lower Flammability Limit (LFL) for an equivalent concentration of vapor. The potential for ignition of a solution of propylene glycol or glycerin and water is limited by the need to evaporate water from the solution prior to ignition. Limited data has been identified on the ignition potential of droplets of antifreeze solution at concentrations permitted by NFPA 13. However, it is clear from the available literature that the
use of antifreeze solutions in concentrations exceeding those permitted by NFPA 13 must be avoided.

Existing laboratory test data was identified regarding the effectiveness of sprinklers when discharging antifreeze solutions of propylene glycol or glycerin.\textsuperscript{11,44,45,46} For certain test conditions, an increase in energy released of 18 to 76\% has been measured during the time of antifreeze application compared with water alone.\textsuperscript{11,44} These tests included antifreeze solutions at concentrations permitted by NFPA 13 that were found to contribute to the energy released during a fire condition.

NFPA 13 recognizes that the potential combustibility of antifreeze solutions may be mitigated, because antifreeze solutions will only be discharged for a limited duration upon activation of a sprinkler system and will be followed by the application of water.\textsuperscript{3} NFPA 13, however, does not provide guidance on the duration of antifreeze solution discharge that is considered acceptable or limit the size of antifreeze sprinkler systems. It is also unclear from the existing research how water spray densities in excess of the minimum required to control a fire condition would impact the contribution of antifreeze solutions to the energy released.

A series of preliminary tests was recently funded and conducted by Underwriters Laboratories to provide initial investigations of antifreeze sprinkler systems in residential applications. A complete report outlining the results of the test series was not available prior to this report being issued, because the tests are very recent. A detailed analysis of the test results should be conducted when the data is available. CCI witnessed several of the tests on behalf of the Foundation. Initial observations from the test series indicate that solutions of 70\% glycerin or 60\% propylene glycol in water may be ignited when discharged through sprinkler systems, resulting in a substantial fire event. This large-scale ignition of the antifreeze solution results in flames surrounding the majority of the sprinkler spray. Large-scale ignition of the antifreeze solutions did not occur in all of the 70\% glycerin or 60\% propylene glycol test configurations, or in any of the tests using a 50\% glycerin in water solution. Observations from the tests indicate that the potential for large-scale ignition of an antifreeze solution depends on a several factors including, but not limited to, the type of sprinkler, sprinkler operating pressure, initial fire condition, location of the initial fire condition with respect to the sprinkler, and the type and concentration of antifreeze solution. Further investigation of glycerin and propylene glycol antifreeze solutions is necessary to more thoroughly investigate the appropriateness of glycerin and propylene glycol solutions for use in automatic sprinkler systems; however, the preliminary tests conducted by UL indicate the potential for substantial fire events to result from the use of 70\% glycerin and 60\% propylene glycol solutions in water.

Two fire incident reports have been obtained where the discharge of antifreeze from a sprinkler system was alleged to have contributed to a fire condition.\textsuperscript{12,13} The discharge of antifreeze solution from a fire sprinkler system was alleged to result in a flash fire in one of the incidents.\textsuperscript{13}
and an explosion in the other incident.\textsuperscript{12} The flash fire incident was located in an outdoor restaurant seating area and the explosion incident occurred in an indoor residential kitchen. Confinement of a flash fire can lead to an overpressure or what is commonly termed an explosion.\textsuperscript{14} Although the consequences of a flash fire and an explosion can be significantly different, the occurrence of either a flash fire or an explosion should be avoided, since a flash fire by itself can be hazardous and under the correct conditions can become an explosion.

Although the prior research did not indicate that a flash fire or explosion would be expected to occur for antifreeze solutions at concentrations permitted by NFPA 13\textsuperscript{11,44,45,46}, the recent tests observed at UL indicate that a flash fire and sustained large-scale ignition of antifreeze solution is possible at certain antifreeze concentrations permitted by NFPA 13. Thus, immediate consideration and additional research is recommended to investigate the appropriateness of antifreeze solutions that are currently permitted to be used in sprinkler systems.
I. Introduction

Automatic sprinkler systems significantly limit the potential for loss of life and property in residential occupancies. When portions of automatic sprinkler systems must be located in spaces subject to freezing and temperatures cannot reliably be maintained at or above 40°F, NFPA 13 requires the use of dry pipe, preaction, or antifreeze sprinkler systems, or other systems specifically listed to protect against freezing.

Antifreeze sprinkler systems may be preferable to dry pipe or preaction sprinkler systems in residential applications based on cost, complexity, and reliability. NFPA statistics indicate that wet pipe sprinkler systems, including antifreeze sprinkler systems, operate effectively in a higher fraction of fire conditions where they are present than dry pipe sprinkler systems. In addition, NFPA 13 requires that residential sprinklers used in dry pipe systems must be specifically listed for dry pipe applications; a listed residential sprinkler for dry pipe applications is not currently available. Thus, antifreeze sprinkler systems have had an important role in protecting people and property in instances where portions of sprinkler systems must be located in spaces subject to freezing.

A recent fire incident raised questions regarding the effectiveness of antifreeze sprinkler systems in controlling residential fire conditions. The Fire Protection Research Foundation retained Code Consultants, Inc. (CCI) to perform a literature search and develop a research plan to investigate the impact of antifreeze solutions on the effectiveness of home fire sprinkler systems. The literature review has included the following subjects:

1. Antifreeze sprinkler system requirements
2. Mixing and separation of antifreeze compounds commonly used in sprinkler systems
3. Flammability of antifreeze solutions commonly used in sprinkler systems
4. Factors influencing the flammability of liquids, such as dispersion in droplets
5. Characterization of residential sprinkler sprays
6. Factors influencing the potential for flash fires or explosions from liquid sprays
7. Existing fire test data on the effectiveness of antifreeze solutions at controlling fire conditions
8. Fire incident reports involving antifreeze sprinkler systems
A research plan was developed to supplement the literature search in areas where existing information was limited. In addition, CCI observed a series of fire tests conducted by Underwriters Laboratories, Inc. (UL) to investigate the effectiveness of antifreeze sprinkler systems in controlling certain home fire scenarios. Observations of the preliminary UL testing (as witnessed by CCI) are included in this report. Suggestions for further research are provided to provide a more complete analysis of currently permitted antifreeze solutions as well as to investigate other antifreeze solutions that could be used in sprinkler systems.
II. Definitions

Antifreeze Sprinkler System – A wet pipe sprinkler system employing automatic sprinklers that are attached to a piping system that contains an antifreeze solution and that are connected to a water supply. The antifreeze solution is discharged, followed by water, immediately upon operation of sprinklers opened by heat from a fire.³

Autoignition Temperature (AIT) – The minimum temperature required to initiate or cause self-sustained combustion of a solid, liquid, or gas independently of the heating or heated element.¹⁷

Automatic Sprinkler – A fire suppression or control device that operates automatically when its heat-actuated element is heated to its thermal rating or above, allowing water to discharge over a specific area.³

Combustible Liquid – Any liquid that has a closed-cup flash point at or above 100°F (37.8°C), as determined by the test procedures and apparatuses set forth in Section 4.4 [of NFPA 30].¹⁸

Deflagration – Propagation of a combustion zone at a velocity that is less than the speed of sound in the unreacted medium.¹⁹

Detonation – Propagation of a combustion zone at a velocity that is greater than the speed of sound in the unreacted medium.¹⁹

Dry-pipe Sprinkler System – A sprinkler system employing automatic sprinklers that are attached to a piping system containing air or nitrogen under pressure, the release of which (as from the opening of a sprinkler) permits the water pressure to open a valve known as a dry pipe valve, and the water then flows into the piping system and out the opened sprinklers.³

Explosion – The sudden conversion of potential energy (chemical or mechanical) into kinetic energy with the production and release of gases under pressure, or the release of gas under pressure. These high-pressure gases then do mechanical work such as moving, changing, or shattering nearby materials.²⁰

Flammable Liquid – Any liquid that has a closed-cup flash point below 100°F (37.8°C), as determined by the test procedures and apparatus set forth in Section 4.4 [of NFPA 30], and a Reid vapor pressure that does not exceed an absolute pressure of 40 psi (276 kPa) at 100°F (37.8°C), as determined by ASTM D 323, Standard Test Method for Vapor Pressure of Petroleum Products (Reid Method).¹⁸

Flash Fire – A fire that spreads rapidly through a diffuse fuel, such as dust, gas or the vapors of an ignitable liquid, without the production of damaging pressure.²⁰
Flash Point – The minimum temperature of a liquid at which sufficient vapor is given off to form an ignitable mixture with the air, near the surface of the liquid or within the vessel used, as determined by the appropriate test procedure and apparatus specified in Section 4.4 [of NFPA 30].

Flashover – A transition phase in the development of a compartment fire in which surfaces exposed to thermal radiation reach ignition temperature more or less simultaneously and fire spreads rapidly throughout the space, resulting in full room involvement or total involvement of the compartment or enclosed space.

Gas – The state of matter characterized by complete molecular mobility and unlimited expansion; used synonymously with the term vapor.

Hygroscopic – Descriptive of a substance that has the property of adsorbing moisture from the air.

Lower Flammability Limit (LFL) – The lowest concentration of a gas or vapor that will just support the propagation of flame away from a pilot ignition source.

Miscibility – The ability of a liquid or gas to dissolve uniformly in another liquid or gas.

Preaction Sprinkler System – A sprinkler system employing automatic sprinklers that are attached to a piping system that contains air that might or might not be under pressure, with a supplemental detection system installed in the same areas as the sprinklers.

Residential Sprinkler – A type of fast-response sprinkler having a thermal element with an RTI of 50 (meters-second) $^{1/2}$ or less, that has been specifically investigated for its ability to enhance survivability in the room of fire origin, and that is listed for use in the protection of dwelling units.

Solution – A uniformly dispersed mixture at the molecular or ionic level, of one or more substances (the solute) in one or more other substances (solvent).

Upper Flammability Limit (UFL) – The highest concentration of a vapor or gas that will ignite and burn with a flame in a given atmosphere.

Vapor – The gas phase of a substance, particularly of those that are normally liquids or solids at ordinary temperatures.

Water-Miscible Liquid – A liquid that mixes in all proportions with water without the use of chemical additives, such as emulsifying agents.
Wet Pipe Sprinkler System – A *sprinkler system employing automatic sprinklers attached to a piping system containing water and connected to a water supply so that water discharges immediately from sprinklers opened by heat from a fire.*³
III. Background

This section summarizes relevant background information from the literature search, including NFPA 13 requirements, chemical data on propylene glycol and glycerin, relevant chemistry, residential sprinklers, and factors influencing the flammability of liquids and explosions.

A. NFPA 13 Requirements for Antifreeze Systems

The following are the current versions of NFPA 13 that address the installation of sprinkler systems:

- **NFPA 13D** *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes (2010 edition)*
- **NFPA 13R** *Standard for the Installation of Sprinkler Systems in Residential occupancies up to and Including Four Stories in Height (2010 edition)*

NFPA 13R requires antifreeze systems to be installed in accordance with NFPA 13, and NFPA 13D includes substantially similar requirements for antifreeze solutions as those found in NFPA 13. Thus, the discussion in the report will be based on NFPA 13, but also addresses NFPA 13D and NFPA 13R.

The purpose of NFPA 13 is, “to provide a reasonable degree of protection for life and property from fire through standardization of design, installation, and testing requirements for sprinkler systems. . . .” The purpose of NFPA 13D is, “to provided a sprinkler system that aids in the detection and control of residential fires and thus provides improved protection against injury and life loss.” The purpose of NFPA 13R is, “to provide a sprinkler system that aids in the detection and control of residential fires and thus provides improved protection against injury, life loss, and property damage.” Automatic sprinkler systems that contain antifreeze-water mixtures have been addressed in NFPA 13 for more than 60 years. Automatic sprinkler systems that incorporate antifreeze solutions are classified as wet pipe systems.

The intent of antifreeze sprinkler systems is to protect sprinkler piping that passes through areas that could be exposed to freezing temperatures. For example, antifreeze sprinkler systems may be used in freezers, loading docks, elevator penthouses, or elevator shafts in commercial buildings. Antifreeze sprinkler systems may also be used in residential areas that are not protected against freezing temperatures. This could include sprinklers protecting unconditioned areas of a residential building or sprinklers serving a conditioned area of a residential building where the pipe passes through an unconditioned area such as an attic.
NFPA 13 outlines several requirements for the proper design and installation of antifreeze sprinkler systems. The requirements are designed to, “minimize the concentration of the solution and, therefore, minimize the potential effect on the extinguishment capabilities of the solution.”\(^2\)

The use of antifreeze solutions in fire sprinkler systems is required to conform to state and local health regulations. NFPA 13 only permits the use of nontoxic antifreeze solutions when the system is connected to a public water supply. NFPA 13 also differentiates antifreeze solution requirements between sprinkler systems supplied by potable and non-potable water connections.

NFPA 13 permits glycerin-water and propylene glycol-water mixtures for use in antifreeze sprinkler systems connected to either potable or nonpotable water supplies.\(^3\) The following tables illustrate the antifreeze solution requirements for potable and non-potable water connections:

<table>
<thead>
<tr>
<th>Material</th>
<th>Solution with Water (by Volume)</th>
<th>Specific Gravity at 60 °F (15.6 °C)</th>
<th>Freezing Point °F</th>
<th>°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glycerin (C.P. or U.S.P grade)</td>
<td>50% glycerin</td>
<td>1.145</td>
<td>-20.9</td>
<td>-29.4</td>
</tr>
<tr>
<td></td>
<td>60% glycerin</td>
<td>1.171</td>
<td>-47.3</td>
<td>-44.1</td>
</tr>
<tr>
<td></td>
<td>70% glycerin</td>
<td>1.197</td>
<td>-22.2</td>
<td>-30.1</td>
</tr>
<tr>
<td>Propylene glycol</td>
<td>40% propylene glycol</td>
<td>1.034</td>
<td>-6</td>
<td>-21.1</td>
</tr>
<tr>
<td></td>
<td>50% propylene glycol</td>
<td>1.041</td>
<td>-26</td>
<td>-32.2</td>
</tr>
<tr>
<td></td>
<td>60% propylene glycol</td>
<td>1.045</td>
<td>-60</td>
<td>-51.1</td>
</tr>
</tbody>
</table>

C.P.: Chemically pure. U.S.P.: United States Pharmacopoeia 96.5%

Table 1: Adapted from NFPA 13 Table 7.6.2.2 Antifreeze Solution to be Used if Potable Water is Connected to Sprinklers
Antifreeze solutions of glycerin, diethylene glycol, and ethylene glycol were included in NFPA 13 starting in the Appendix of the 1940 edition, known as National Board of Fire Underwriters Pamphlet No. 13 at the time.\(^1\) The 1953 edition of NFPA 13 included requirements for antifreeze sprinkler systems in the body of the standard and permitted the use of propylene glycol or calcium chloride solutions as well as glycerin, diethylene glycol, and ethylene glycol.\(^2\)\(^4\) The antifreeze solutions and concentrations permitted by the 1953 edition of NFPA 13 are the same as those permitted by the current (2010) edition of NFPA 13, with the exception that calcium chloride is no longer permitted.

The exclusive use of premixed antifreeze solutions is not required by NFPA 13; however, it may be required for certain specially listed equipment or systems. The Annex to NFPA 13 cautions against the use of antifreeze solutions that are mixed on-site. When antifreeze solutions are mixed on-site, the concern exists that the antifreeze-water mixture in the fire sprinkler system may not be homogenous. As discussed in detail later in this report, fully mixed antifreeze solutions of miscible liquids, such as glycerin or propylene glycol and water, will not separate on standing. NFPA 13 references NFPA 25 for regular inspection, testing and maintenance requirements of antifreeze sprinkler systems to verify that an antifreeze sprinkler system has the proper concentration of antifreeze solution.\(^2\) NFPA 13D requires antifreeze sprinkler systems to be emptied each year and the specific gravity of the solution to be measured before refilling the system.\(^23\)
NFPA 13 and NFPA 25 require the specific gravity of antifreeze solutions to be tested annually by hydrometer or refractometer as an indication of the concentration and freezing point of the mixture. An antifreeze solution must be prepared with a freezing point below the expected minimum temperature for the locality. Furthermore, the minimum concentration of antifreeze solutions must be limited for the anticipated minimum temperature. High concentrations may increase the potential that the final solution will have a negative effect on the suppression characteristics of the solution.\textsuperscript{2} In addition, high concentrations may also increase the freezing point for some antifreeze solutions.

The definition of an antifreeze system in NFPA 13 requires that the system discharge water following the antifreeze solution, and recommends that systems supplied only with antifreeze solution should only be used after consideration of, “issues such as the combustibility of the antifreeze solution and the friction loss in the piping during cold conditions.”\textsuperscript{3} Thus, NFPA 13 recognizes that in some instances antifreeze solutions may contribute to a fire condition, but that the supply of water following the antifreeze solution mitigates the contribution to the fire.

B. Antifreeze Solutions

Various antifreeze solutions are available that are designed specifically for use in antifreeze sprinkler systems. The chemicals and concentrations of these products vary by manufacturer; however, there are two main differences: premix (ready-to-go) and concentrate solutions. An example of the properties of several premix antifreeze solutions are illustrated in Table 3:\textsuperscript{25}

<table>
<thead>
<tr>
<th>Chemical</th>
<th>LFL/UFL in Air (% by volume)</th>
<th>Flash Point (°F)</th>
<th>Autoignition Temperature (°F)</th>
<th>Boiling Point (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>propylene glycol &lt;75%, dipotassium phosphate &lt;10%</td>
<td>2.4/17.4</td>
<td>228</td>
<td>700</td>
<td>222</td>
</tr>
<tr>
<td>propylene glycol &lt;50%, dipotassium phosphate &lt;10%</td>
<td>2.4/17.4</td>
<td>228</td>
<td>700</td>
<td>217</td>
</tr>
<tr>
<td>1,2,3-Propanetriol (Glycerin Based)</td>
<td>N/A</td>
<td>350</td>
<td>750</td>
<td>554</td>
</tr>
<tr>
<td>propylene glycol, dipotassium phosphate</td>
<td>2.4/17.4</td>
<td>228</td>
<td>700</td>
<td>370</td>
</tr>
</tbody>
</table>

Table 3: Sample Properties of Premix Antifreeze Solutions\textsuperscript{25,27,28,29}

The following disclaimer is included in the MSDS for one of the premix antifreeze solutions:

\textit{Fire and Explosion Hazards – Heat from fire can generate flammable vapor. When mixed with air and exposed to ignition source, vapors can burn in open or explode if confined. Vapors may travel long distances along the ground before...}
igniting and flashing back to vapor source. Fine sprays/mists may be combustible at temperatures below normal flash point. Aqueous solutions containing less than 95% propylene glycol by weight have no flash point as obtained by standard test methods. However aqueous solutions of propylene glycol greater than 22% by weight, if heated sufficiently, will produce flammable vapors. Always drain and flush systems containing propylene glycol with water before welding or other maintenance.29

The disclaimer (above) identifies the potential for vapors of aqueous solutions that contain certain concentrations of propylene glycol to combust. It is important to consider this potential for combustion when dealing with aqueous solutions that contain flammable liquids (e.g. propylene glycol and glycerin). Furthermore, the disclaimer identifies that fine sprays/mists may be combustible at temperatures below their normal flash point. This concept is discussed in detail later in the report.

The premix antifreeze solutions (above) are either propylene glycol or glycerin based. The solutions that contain propylene glycol have a flash point of 228°F and the solution that is glycerin based has a flash point of 350°F. The flash point of the glycerin based solution is more than 100°F higher than that of the propylene glycol based solution.

Another notable difference among the premix solutions is the range in boiling point. The glycerin based solution has a boiling point of approximately 200 to 300°F higher than that of the propylene glycol based solution. The glycerin solution has a higher flash point and boiling point compared to the propylene glycol based solution.

An example of the properties of concentrate antifreeze solutions are illustrated in Table 4:

<table>
<thead>
<tr>
<th>Chemical</th>
<th>LFL/UFL in Air (% by volume)</th>
<th>Flash Point (°F)</th>
<th>Autoignition Temperature (°F)</th>
<th>Boiling Point (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,2,3-Propanetriol (Glycerin Based)</td>
<td>N/A</td>
<td>350</td>
<td>750</td>
<td>554</td>
</tr>
<tr>
<td>propylene glycol &gt;95%, water &lt;3%, dipotassium hydrogen phosphate &lt;3%</td>
<td>2.6/12.5</td>
<td>219</td>
<td>700</td>
<td>306</td>
</tr>
</tbody>
</table>

Table 4: Sample Properties of Concentrate Antifreeze Solutions30,31

Similar to the examples of the premix antifreeze solutions from Table 3, the concentrate solutions are either propylene glycol or glycerin based. The glycerin based solution has a higher flash point than the propylene glycol based solution by over 100°F. The boiling point of the glycerin solution is approximately 200°F higher than that of the propylene glycol based solution.
C. Chemistry of Solutions

Common antifreeze compounds used in fire sprinkler systems, such as propylene glycol and glycerin, form a solution with water. In chemistry, a solution is a homogenous (uniform throughout) mixture of at least two components. The particles in a solution can be characterized as having diameters in the range of 0.0001 to 0.002 μm, the size of a typical ion or small molecule. Other types of mixtures, such as colloids and suspensions, can be characterized by larger particle diameters. An important property of solutions is that they do not separate on standing.4

The component of a solution in the greater proportion is known as the solvent (the dissolving medium) while the lesser component is known as the solute (the substance being dissolved). For example, a gram of salt completely dissolved in a glass of water illustrates a solution that consists of two components; the solute (salt) and the solvent (water).4

Solute and solvents can be mixed in a variety of concentrations. A solution is said to be concentrated if it contains a relatively large amount of solute per unit volume of solution. For mixtures of certain substances, however, there is a limit to the amount of solute that can be dissolved in any given solvent. This is known as solubility.

The solubility of a substance in a given solvent is a physical property characteristic of that substance. For a liquid-liquid mixture, the solubility depends on the chemical make-up of the substances involved and whether they will dissolve in each other. Two liquids are said to be miscible if they are mutually soluble in all proportions and will remain mixed under normal conditions. For example, propylene glycol and glycerin are miscible in water.32,33

The molecular structures of glycerin and propylene glycol are illustrated in Figure 1, below. Both glycerin and propylene glycol include hydroxyl (OH) groups that bond with water. Thus, in addition to being miscible with water, they are also hygroscopic and bond even with water from the surrounding air.21
Liquid-liquid mixtures may be miscible (capable of being mixed), partially miscible or immiscible (not capable of being mixed). Changes in temperature and pressure may change the solubility of liquids partially miscible in one another; however, miscible liquids are expected to be mutually soluble in all proportions over a complete range of temperatures and pressures. 4

Because both glycerin and propylene glycol are miscible in water, antifreeze solutions of water mixed with either glycerin or propylene glycol would form solutions at any proportions. For example, solutions can be formed of 99% glycerin and 1% water, 1% glycerin and 99% water, or any other combination of glycerin and water. Note that density differences between either glycerin or propylene glycol and water do not prevent them from forming a solution. Because both propylene glycol and glycerin form solutions with water, any such mixture of propylene glycol or glycerin and water would not separate on standing.

D. Residential Sprinkler Systems

Automatic sprinkler systems have been used in industrial and commercial occupancies for more than 100 years. However, the use of automatic sprinkler systems in residential occupancies is not very common in the United States. According to recent research, 80% of U.S. fire deaths occur in residences. 34

New developments in residential sprinkler system technology continually reduce the cost of installation while maintaining the effectiveness and reliability of the system. These new developments are intended to increase the number of residential sprinkler systems installed in
the U.S. It is estimated that less than three percent of all residential occupancies in the U.S. have fire sprinkler systems installed.35

The impact that fire sprinkler systems have on reducing deaths and injuries in residential fires was assessed by the United States Fire Administration (USFA) from 1979 into the late 1990s.36 The USFA worked in conjunction with NFPA, UL, and Factory Mutual Research Corporation (FM). Together with the USFA, these organizations evaluated the design, installation, practical use, water discharge rate, response sensitivity and design criteria of residential sprinkler systems.36 Research concluded that sprinklers with higher sensitivity (lower RTI) performed better than lower sensitivity (higher RTI) sprinklers in residential fire applications. This research conducted by FM suggested that a more sensitive sprinkler would respond faster to both smoldering and fast-developing home fires. As a result, the quick-response sprinkler was developed to quickly control fires and help prevent the development of lethal conditions in small home compartments.36

In addition to fast-response characteristics, residential sprinklers have special water distribution patterns. The spray pattern is designed to deliver a portion of the water high on walls to prevent a fire from getting "above" the sprinklers and to cool gases at the ceiling level.37

The upper spray distribution delivers water close to the ceiling not only to protect the area of the wall close to the ceiling but also to increase the capacity of the spray to cool hot layer gases at the ceiling level. The cooling of these gases helps reduce the probability of excessive sprinkler activations. Excessive sprinkler activation may overload the hydraulic design of the sprinkler system and reduce the water density of the spray distribution. As a result, this could limit the ability of the sprinkler system to suppress a fire.

Unlike traditional sprinklers, the quick-response sprinkler expanded the goal of sprinklers to protect not just property but also to increase life safety. Design parameters for quick-response sprinklers were studied by the applicable NFPA technical committees and were used to establish criteria for the 1980 edition of NFPA 13D Standard for the Installation of Sprinkler Systems in One- And Two-Family Dwellings and Manufactured Homes.

Similar to NFPA 13D, NFPA 13R Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height is designed with respect to life safety and property protection. NFPA 13R is designed to be more conservative than NFPA 13D, because there is greater risk associated with multifamily occupancies.36

The purpose of NFPA 13R is to provide a sprinkler system that aids in the detection and control of residential fires. Therefore providing improved protection against injury, life loss and property damage.22
The minimum requirements for spacing, location and position of sprinklers are based on the following principles:

1. Sprinklers must be installed throughout the premises (certain areas are permitted to remain unsprinklered).

2. Sprinklers must be located so as not to exceed maximum protection area per sprinkler.

3. Sprinklers must be positioned and located so as to provide satisfactory performance with respect to activation time and distribution.

E. Approval Standards for Residential Sprinklers

Due to their differences compared to standard pendent sprinklers, residential sprinklers are listed using a different standard. Product evaluation organizations have developed specialized standards such as UL 1626, *Standard for Safety for Residential Sprinklers for Fire-Protection Service*. FM global developed Approval Standard FM 2030, *Research Approval Standard for Residential Automatic Sprinklers*, for residential sprinklers. Both standards include a plunge test with specific sensitivity requirements. In addition, both standards include a distribution test that checks the spray pattern in the vertical and horizontal planes. Both UL 1626 and FM 2030 also include a fire test that is intended to simulate a residential fire in the corner of a room containing combustible materials representative of a living room environment. 36

The UL 1626 test procedures include a fuel package with three varying test configurations. The fuel package is composed of several different components: a wood crib, two simulated furniture ends covered with foam, two sheets of ¼ inch Douglas fir plywood, a pan with heptane, and two heptane-soaked cotton wicks. The various test configurations are used to test pendent, upright, flush, recessed pendent, concealed and sidewall sprinklers. 36

To meet the UL 1626 fire control criteria, residential sprinklers, installed in a fire test enclosure with an 8-ft ceiling, are required to control a fire for 10 minutes with the following limits:

1. The maximum gas or air temperature adjacent to the sprinkler 3 inches below the ceiling at two locations within the room must not exceed 600°F.

2. The maximum temperature 5 feet 3 inches above the floor at a specified location within the room must be less than 200°F during the entire test. This temperature must not exceed 130°F for more than a 2 minute period.

3. The maximum temperature ¼ inch behind the finished surface of the ceiling material directly above the test fire must not exceed 500°F.

4. No more than two residential sprinklers in the test enclosure can operate. 36
To meet the UL 1626 water distribution requirements, the water spray distributions are collected in both the vertical and horizontal planes. The quantity of water collected on both the horizontal and vertical surfaces is measured and recorded. Sprinklers being tested are required to discharge a minimum of 0.02 gpm/ft² over the entire horizontal design area, with the exception that a limited area is permitted to be less than 0.02 gpm/ft² as long as it is at least 0.015 gpm/ft². The sprinklers must also wet the walls of the test enclosure to a height not less than 28 inches below the ceiling with one sprinkler operating. Each wall surrounding the coverage area is required to be wetted with a minimum of five percent of the sprinkler flow.  

F. Sprinkler Droplet Sizes and Distributions

Droplet sizes and distributions produced by automatic sprinklers have been studied using a variety of techniques including Phase Doppler Interferometry (PDI) and Particle Tracking Velocimetry and Imaging (PTVI). New research techniques are being developed to analyze the atomization (e.g. sheet breakup locations and initial drop sizes) and dispersion (e.g. volume density and local drop size profiles) in sprinkler sprays. This research primarily focuses on droplet sizes greater than 200 μm but may focus on smaller droplet sizes in the future. Measurements of the droplet sizes produced by automatic sprinklers are relatively complex, because the droplet size distribution measured is expected to vary with several factors including:

1. Position with respect to the sprinkler in 3-dimensions
2. Sprinkler model
3. Operating pressure/flow rate
4. Liquid supplied to the sprinkler, e.g. water or antifreeze solution
5. Surrounding air currents, including fire induced flows

Even with all of the variables above held constant, measurements include a range of droplet sizes and not a single uniform droplet size. In addition, very limited information is available on the droplet distributions for sidewall sprinklers.

Putorti analyzed existing fire sprinkler droplet size and velocity measurement methods and identified limitations of the existing methods. Putorti’s research included the development of the PTVI technique to provide large-scale, simultaneous, non-intrusive measurement of droplet size and velocity in two phase flows.

The PTVI testing apparatus used by Putorti illuminates a 0.5 m by 0.5 m region of the spray field with two consecutive laser sheet pulses of different wavelengths. Dyes in the water fluoresce in
two different colors, resulting in two differentiable color images for each drop, which are recorded by high-speed camera. Drop velocity is determined from the distance traveled in the time between the pulses, and size from the areas of the droplet images.

Putorti found that droplet sizes from standard orifice, pendent spray fire sprinklers are between approximately 200 and 3,000 μm with velocities on the orders of 1 m/s and 10 m/s. This approximation agreed with existing research which indicated that droplets larger than approximately 5,500 μm in diameter are unstable and break up into smaller droplets, predominantly in the range of 1,000 to 2,000 μm\textsuperscript{39}. Putorti had already discovered from previous research that while a large number of very small drops are present, they comprise a small portion of the total water volume. Data indicates that 98% of the water from standard orifice fire sprinklers is contained in droplets larger than 200 μm in diameter.\textsuperscript{40}

The PTVI method enabled Putorti to measure droplet size and velocity distributions with a low level of uncertainty. Unlike the PDI technique, which only measured data at a single point, the PTVI method allowed data measurement over a larger area (0.5m x 0.5m) simultaneously. Based on this data, large scale unsteady behaviors could be studied and directly compared with water sheet breakup predictions to verify droplet trajectories predicted by computer modeling.\textsuperscript{9}

The PDI technique measures drop size and velocity. Droplets are illuminated by two incident laser beams and the scattered light signals are detected and analyzed. The scattered light signals form fringe patterns. The spatial frequencies of the fringe patterns are inversely related to the drop diameter. This measurement technique works well for spherical droplets. However, sprinkler droplets are not always spherical.\textsuperscript{9}

Widmann used the PDI technique to measure droplet size distributions from a residential sprinkler.\textsuperscript{10} The sprinkler investigated had a k-factor of 5.6 gpm/psi\textsuperscript{1/2} and was supplied with water at a pressure of 19 psig ± 1 psig during the testing. Measurements were taken at 1.12 m below the sprinkler and the results were found to vary depending on if measurements were taken near or far from the axis of the sprinkler. Measurements of water droplet sizes ranged from an arithmetic mean of 200 to over 500 μm, depending on location. However, droplets with diameters of less than 100 μm were measured near the axis of the sprinkler.

The PDI technique involves point measurements made at various locations in the sprinkler flow (results are temporally and spatially averaged). This technique for determining attributes of sprays from fire sprinklers is limited by several factors. First, sprays generated by fire sprinklers are unsymmetrical and unsteady. Certain areas of the spray distribution are denser than others. Furthermore, some areas of the spray distribution contain different drop sizes than the statistical average. Since the PDI technique involves point measurement, the results obtained by this method may vary dependent on where the point measurements are taken within the spray distribution. These limitations are relevant to all point measurement techniques.\textsuperscript{9}
Factory Mutual (FM) studied the spray distribution characteristics of antifreeze-water solutions for use in Early Suppression Fast Response (ESFR) sprinklers. Specifically, FM sought to determine if a fluid, with a greater density and viscosity, had a significantly different spray distribution than that of water. Theoretical analyses were conducted followed by experimental analyses.

FM theorized that the mean drop size is directly dependent on the orifice diameter of the sprinkler type in addition to the system pressure and fluid properties of the solution being discharged. Specific fluid properties included surface tension, dynamic viscosity and density. According to the report, droplet formation is governed by surface tension, which causes the breakdown of water sheets into droplets. FM further predicted that fluid viscosity is directly related to a droplet’s oscillation activity. Droplets with high oscillation activity and low fluid viscosity tend to break apart and form smaller droplets. Inversely, liquids with high oscillation activity and high fluid viscosity tend to not break apart. This dampening in oscillations will theoretically lessen the probability that larger droplets will breakdown into smaller droplets.

It is important to note that sprinkler spray patterns entrain large amounts of air which carry small drops toward the inner spray axis. It can be observed in this phenomenon that the majority of larger droplets fly towards the outer regions of the spray pattern. This correlation suggests that high viscosity fluids (antifreeze) will have fewer small drops and a lower spray density near the inner spray axis.

Following their theoretical predictions, FM conducted experimental tests for water and antifreeze fluids that included: 60% potassium lactate, 60% potassium acetate, and 28.5% calcium chloride. Spray distribution was observed for each fluid at ambient temperature. A single K-25 ESFR sprinkler was supplied with approximately 175 gpm of fluid. The antifreeze fluids had higher densities than that of water and higher pressures at the sprinkler were required to achieve the same volumetric flow rates.

The spray patterns were observed both photographically and visually. A series of two tests were performed for each fluid. FM concluded that the spray patterns for both the water and antifreeze fluids were virtually identical. This observation contradicts the theoretical predictions that antifreeze fluids with higher viscosities would have distinctively different spray patterns to that of water alone. Further research is required to characterize the effect of the fluid characteristics on droplet size distributions from residential sprinklers.

G. Flammability of Liquids

Liquids are substances whose vapor pressure at a reference temperature (commonly 25°C) is less than 1 atm. However, the actual state of a substance (gas, solid or liquid) is dependent on both its pressure and its temperature. For example, nitrogen is a gas at room temperature;
however, it is commonly sold in liquid form. This phenomenon occurs when nitrogen gas is compressed in a container. In this example, the liquefaction of nitrogen occurs when nitrogen gas is compressed.

NFPA 30, *Flammable and Combustible Liquids Code*, defines a liquid as any material that (1) has a fluidity greater than that of 300 penetration asphalt when tested in accordance with ASTM D 5, *Standard for Penetration of Bituminous Materials*, or (2) is a viscous substance for which a specific melting point cannot be determined but that is determined to be a liquid in accordance with ASTM D 4359, *Standard Test for Determining Whether a Material is a Liquid or a Solid*.

Liquids have many quantifiable properties that vary depending on the type of liquid and the environment it is exposed to. An example of these properties are a liquid’s upper flammability limit (UFL) and lower flammability limit (LFL). These properties of a liquid stem from the phenomenon of concentration gradients around liquids in an open container. For liquids in containers open to the atmosphere, there is a continuous loss of liquid through evaporation. As such, a concentration gradient may exist above the liquid. This concentration gradient will vary based on factors such as height, pressure and air motion. Essentially, the UFL is the highest concentration of a gas or vapor in air capable of producing a flash fire in the presence of an ignition source. The LFL is the lowest concentration capable of producing a flash fire.\(^7\)

If an ignition source is brought near an open vessel of a flammable liquid, ignition will only be possible at certain distances from the surface of the liquid. At distances far from the surface of the liquid, the concentration of vapors will be below the LFL. As the ignition source approaches the surface of the liquid, there will be a region where ignition is possible because the concentration of vapors is between the UFL and LFL. Finally, as an ignition source is brought even closer to the surface of the liquid, ignition will no longer be possible again. At this point, the concentration of vapors will be above the UFL.\(^7\)

The flash point is the temperature at which a liquid must be raised in order to produce sufficient vapors for flash ignition. The flash point can be measured by one of many standardized test apparatuses. These devices are usually characterized as open-cup or closed-cup arrangements.\(^7\)

Maintaining a liquid at a temperature below its measured flash point does not guarantee that ignition will be prevented. There are many factors that may influence a liquid’s actual flash point. This is because the flash point of a liquid, as measured by test apparatus, is not necessarily the flash point of a liquid in its end-use environment. Liquids with flash point temperatures greater than the temperature of the environment of the liquid may sometimes be ignited by spraying, wicking or other means. Liquids that are mixtures, as opposed to pure substances, may demonstrate a tendency for vaporization of one component and not the other. The flash point of the remaining liquid may be different than that of the mixture when it was originally tested.\(^7\)
At some temperature above a liquid’s flash point temperature, an ignitable liquid’s vapor (that accumulates in a closed space) can ignite without the presence of an ignition source. This is known as the autoignition temperature (AIT). There is no known relation between a liquid’s flash point and its AIT. The AIT is primarily determined by a liquid’s reactivity (rate of oxidation) while the flash point is determined by a liquid’s volatility (rate of evaporation). Many factors may affect a liquid’s AIT. Some known factors are the concentration of the vapor given off by the liquid, the shape and size of the container, the rate and duration of heating and the testing method.¹⁷

Critical to this report is the combustion of atomized liquids (mists, vapors or sprays) produced during the operation of an automatic sprinkler system. Typically in a condensed mist, the diameter of most of the droplets is less than 10 μm. Aerosols that have been produced by the atomization of a liquid by mechanical force typically have a droplet diameter of greater than 100 μm.⁸ As indicated above, testing shows that 98% of the droplet sizes from standard orifice pendant spray fire sprinklers are between approximately 200 and 3,000 μm in diameter.

A suspension of finely divided droplets of flammable liquid in air can yield a flammable mixture that has many of the characteristics of a flammable gas/air mixture. These droplets have the potential to burn or explode. Researchers have observed that a 10 μm diameter droplet of flammable liquid behaves like a vapor with respect to burning velocity and LFL. Droplets with diameters larger than 40 μm behave differently.⁸

Flame propagation can occur at average concentrations well below the LFL. A flammable mixture can also form at temperatures below the flash point of a liquid combustible when atomized into air. Testing shows that with fine mists and sprays (particles less than 10 μm) the combustible concentration at the lower limit is about the same as that in uniform vapor-air mixtures. However, as the droplet diameter increases, the lower limit appears to decrease. It was observed that coarse droplets tend to fall towards the flame front in an upward propagating flame, and as a result the concentration at the flame front actually approached the value found in lower limit mixtures of fine droplets and vapors.⁴¹

Mists made up of coarser aerosols are capable of sustaining a flame at considerably lower fuel-air ratios than fine aerosols (vapors). The reason for this lies in the ability of the droplets to move in relation to the ambient air. Mists made up of coarser aerosols prove to be more responsive to acceleration and random movement than that of finer aerosols. As such, coarser aerosols communicate flame more readily.⁸

In the case of water-glycols, flash points will not exist until the excessive water has been removed. Research indicates that a high-temperature environment is required to realize a flash point hazard with the vapors of these fluids at normal pressure conditions.⁶
H. Factors Required for an Explosion

In a fuel-air cloud, flame can propagate in two modes: a deflagration or a detonation. A deflagration involves subsonic flame speeds from a few meters per second up to 1,000 m/s. This magnitude of flame speed results in overpressures from near zero up to several bar. A detonation involves supersonic (relative to the speed of sound in the unburned gas ahead of the wave) combustion waves. In this case, the shock wave and combustion wave are coupled. These waves will propagate at a velocity of 1,500 to 2,000 m/s and cause explosion pressures with magnitudes of 15-20 bar.  

If ignition occurs before a fully mixed fuel-air cloud has been formed, a flash fire or deflagration will occur instead of a detonation. Furthermore, it is important to understand that when a cloud of flammable vapor (fuel-air) burns, the combustion may or may not give rise to an overpressure. In a flash fire, there is no overpressure. In an explosion, there is overpressure. 

Large combustible premixed fuel-air clouds that have been formed in the presence of an ignition source are the most dangerous. If ignition occurs, the pressure generated by the combustion wave is directly related to the speed of flame propagation and the nature of pressure expansion away from the fuel-air cloud. This relationship is governed by confinement.

The pressure build up associated with gas explosions is a relation of the pressure generation by the flame and the relief of the pressure, through venting. Furthermore, an explosion in a compartment is a very complex process that involves several parameters that include: type of fuel, size and concentration of the fuel cloud, ignition and geometrical layout (i.e. confinement, venting and obstructing objects). In a small compartment with no to very little venting, even slow burning can cause pressure build up. In extreme cases, it has been observed that a slow flame can cause pressures up to 8 bar in a compartment that remains closed. Vent openings are of major importance in keeping explosion pressure down.

I. Existing Approval Standards and Test Methods for Ignition Properties of Liquids

Flammability characteristics of liquids are measured using a variety of test methods. The following are common measures of the flammability of a liquid.

Flash Point

Several test standards exist for measuring flash point. The Cleveland open-cup test method, ASTM D 92, is commonly used for products that have a flash point between approximately 174°F and 750°F. The test uses a cup with 70mL of test liquid. Temperature uniformity across the bottom of the cup is regulated by a metal plate. The metal plate can be heated by either a
gas burner or an electric resistance heater. The test liquid is heated at a rate of approximately 41°F to 43°F per minute. The purpose of the test is to measure the flash point of the test liquid.\(^7\)

Another method to test a liquid's flash point is the Pensky-Martens closed-cup (PMCC) tester, ASTM D 93, is limited to testing substances with a viscosity greater than 5.5 cSt at 104°F. The tester utilizes a heated stirrer (intended to maintain temperature uniformity) inserted into the test liquid. The test liquid is heated at a rate of approximately 41°F to 43°F per minute. The PMCC is used to measure the flash point of liquids between 174°F and 750°F.\(^7\)

**Autoignition Temperature**

The AIT is highly dependent on the test method used. Some of the variables known to affect the AIT are the shape and size of the testing volume, the concentration of the gas or vapor in the mixture and the duration and rate of heating, based on the ignition source. Since there are many different testing methods that have been developed to measure the AIT of liquids, it is not uncommon to find different AIT values for the same material.\(^7\)

ASTM E 659 is an example of a test method used to measure AIT of liquids. In this method, the testing vessel is a glass flask surrounded by an electrically heated oven equipped with several thermocouples. To conduct a test, a 0.1 mL sample of liquid is injected into the glass flask. The flask is heated to a constant temperature and is observed for 10 minutes (in a fully darkened room) for indications of ignition. If ignition does not occur, the temperature of the electric oven is raised and the process is repeated. Once the AIT is observed, both larger and smaller amounts of the liquid are analyzed to determine the overall lowest AIT.\(^7\)

ASTM E 659 replaced older versions of ASTM AIT tests such as ASTM D 286 and ASTM D 2155 (both withdrawn from ASTM recommended testing methods). Results obtained from ASTM E 659 are typically lower than that from ASTM D 2155, and the differences are greater for more volatile fuels. Similar to ASTM E 659, ASTM D 2155 involves the heating of the sample liquid in a glass vessel. This vessel is observed for AIT for only five minutes (five minutes less than ASTM E 659). ASTM D 286 did not allow for visual observation of AIT and, as such, the apparatus was criticized on a practical basis.\(^7\)

**Flammability of Fluid Sprays**

As discussed above, flash point measurements are not a reliable indication of the potential for ignition of a liquid dispersed into droplets. FM Global Class Number 6930 *Approval Standard for Flammability Classification of Industrial Fluids\(^42\)*, was developed to evaluate the ignition potential of industrial fluid sprays. For example, in industrial applications the failure of a pressurized hose could allow potentially combustible fluids to spray onto nearby ignition sources. Approval Standard 6930 classifies the flammability of industrial fluids based a series
of tests that are design to characterize the spray flame hazard of an industrial fluid. Because the potential for ignition of a liquid spray differs from a pool of the same liquid, Approval Standard 6930 may provide a more reliable method of characterizing the flammability of antifreeze solutions used in sprinkler systems than more common measurements such as flash point.

The approval standard requires industrial fluids to be screen tested to determine a flash point or verify that the fluid will boil prior to obtaining a flash point. The screening test required by this approval standard is the Cleveland open-cup test, ASTM D92.

Industrial fluids submitted for testing (having a flash point) must satisfy each of the following performance criteria to be eligible for FM Approval:

- Determination of the flash point by Cleveland open-cup;
- Determination of the chemical heat release rate (HRR) of a highly atomized spray of the industrial fluid;
- Determination of the industrial fluid density per ASTM D1480 or ASTM D4052;
- Calculation of the critical heat flux for ignition of the industrial fluid;
- Calculation of the Spray Flammability Parameter of the industrial fluid.

The Spray Flammability Parameter (SFP) calculated as part of the approval process is intended as an indication of the potential for ignition of a hydraulic fluid dispersed as droplets. The value of the SFP combines the chemical heat release rate from spray fires and the volatility of fluids in terms of a critical heat flux for ignition. The chemical heat release rate used in the equation is measured from the FMRC Fire Products Collector and fluid spray setup. In this test, fluids are sprayed vertically upward in the open from an 80 degree hollow cone nozzle with an exit diameter of 0.38 mm. The tip of the nozzle is in the same plane as a propane ring burner. All of the combustion products (along with the ambient air) are captured in a sampling duct that is equipped with instrumentation for oxygen consumption calorimetry. In the sampling duct measurements are made for the total volumetric flow rate of the mixture of fire products and air; gas temperature; generation rates of carbon monoxide and carbon dioxide; and the consumption rate of oxygen. The chemical heat release rate used to calculate the SFP is the average steady state values measured by the calorimeter.

The value of the SFP depends on the initial temperature of the fluid, the degree of atomization, and the temperature of air entrained into the jet. The SFP is a measure of the degree of spray flame hazard for hydraulic fluids. Fluids associated with higher SFP values have a higher burning rate while fluids with lower SFP values have lower burning rates.
Additional requirements exist for industrial fluids that do not have a flash point. Since propylene glycol and glycerin both have measured flash points, the other requirements are not outlined in this report.
IV. Existing Fire Incident Reports

Two existing fire incident reports have been obtained that involve fires related to automatic sprinkler systems containing antifreeze solutions. After a fire incident, fire investigators are often called to the scene to conduct a fire analysis. Investigators collect data, analyze the data and develop a hypothesis based on the research conducted. A fire investigator’s hypothesis outlines the suspected cause of the fire and identifies other critical factors relating to the fire incident. It is important to note that while a fire investigator’s hypothesis is based on the best available information and evidence, it is not necessarily a truly provable hypothesis.20

A. Monmouth Beach, NJ

In October of 2001, a fire occurred in a restaurant located in Monmouth Beach, New Jersey. The fire originated in an outside enclosed deck/porch area at the ceiling level. The Fire Marshal of the County of Monmouth conducted the fire investigation and prepared the investigation report dated March 14, 2002.13

According to the report, the restaurant was protected by an automatic sprinkler system that contained an antifreeze-water solution (propylene glycol-water). Located on the ceiling of the porch were nine Sun Pak Heaters rated at 25,000 Btu each. The heaters were natural gas fired and in use at the time of the incident. Located on the wall to the rear of the row of ceiling heaters were sidewall mounted sprinkler heads. The sidewall sprinklers installed had an activation temperature of 155°F, which are recommended for locations with a maximum temperature of 100°F.

After analysis of the incident, it was the opinion of the investigator that the heaters caused the ceiling temperature in the outdoor porch area to rise above the nominal temperature rating of the sidewall sprinklers, thus causing sprinkler activation. Upon activation, the vapors from the sprayed propylene glycol-water solution (contained in the sprinkler system) resulted in a flash fire upon interaction with the heaters. This flash fire resulted in flames that traveled across the ceiling and continued into the inside of the restaurant. When all of the propylene glycol-water solution had been discharged, the plain water followed and the fire was extinguished. The building sustained very limited fire damage and several restaurant patrons received medical treatment for smoke inhalation and thermal skin burns.

B. Truckee, CA

On August 18, 2009, a fire and explosion occurred at the Henness Flats Apartment Complex in Truckee, California.12 The following information is from a report developed by Stephen Hart. Mr Hart was asked by the California Office of the State Fire Marshal (OSFM) to assist as a subject matter expert through the local government request for fire investigation assistance from the OSFM.
The Henness Flats Apartment Complex is a 92-unit multi-building apartment complex. There are 12 individual apartment buildings within the complex. Building #6, where the fire and explosion occurred, was a 2-story structure that consisted of 12 apartment units. The unit where the fire and explosion occurred was located on the first floor and was on the east end of the building.

The automatic fire sprinkler system riser, which served the 12-unit apartment building, was located on the exterior wall adjacent to this unit. According to Mr. Hart’s observations, the force of the explosion caused window glass in the unit to be blown more than 86 feet across the adjacent parking area and caused an interior door frame and attached door to an adjacent bathroom to be separated by approximately 3 inches.

Mr. Hart’s report notes that, according to the submitted fire sprinkler drawings, the overhead fire sprinkler piping was supplied by a 4-inch main that runs the length of the building and stubs up with a 2-1/2-inch riser that feeds the two units on the first and second floor levels. The report also notes that the fire sprinkler drawings indicate that the antifreeze sprinkler system had a capacity of 256.2 gallons and used a 50% solution of glycerin and water designed to have a freezing point of -20.9°F.

It is the opinion of Mr. Hart that the tenant was cooking onions in a frying pan over the electric stove when the contents of the pan caught fire. The tenant turned around (180 degrees) to the kitchen sink with the flaming frying pan to put water on the fire and the fire sprinkler activated directly over him. Upon sprinkler activation, a discharge of glycerin based antifreeze was ignited by the flames coming from the burning onions in the frying pan and an explosion resulted. As a result of the fire and explosion, it was noted that eight of the ten residential sprinklers within the unit activated. The fire sprinkler over the kitchen sink was reported to be a residential pendant sprinkler with a k-factor of 4.9 gpm/psi^{1/2} and an activation temperature of 155°F.
V. Prior Research

Research studies have been conducted by SP Technical Research Institute of Sweden (SP), Factory Mutual (FM), and Underwriters Laboratories (UL) to evaluate the use of antifreeze solutions in sprinkler systems. This section summarizes the prior research and testing as it relates to the use of antifreeze solutions in residential sprinkler systems.

A. SP Research

SP investigated the effect of antifreeze-water mixtures upon interaction with intermediate-scale wood crib fires.44 The tests analyzed antifreeze-water mixtures of calcium chloride, potassium acetate, ethanol, urea, methanol, propylene glycol and glycerin. The tests specifically focused on the potential contribution of the combustion energy of such agents to a fire.

The fire tests were conducted in an intermediate scale. The fire source was a burning wood crib (approximately 730 x 730 x 360 mm). A liquid fuel was applied to the crib that upon ignition would last for three minutes. It was measured that after the igniter fluid was consumed, the free-burn chemical heat release rate of the fire quickly reached a steady heat release rate (HRR) of approximately 800 kW. Furthermore, at four minutes after ignition the antifreeze solution was evenly distributed with spray nozzles (volumetric flow rate of 2.95 L/min) above the wood crib. The antifreeze solution was applied for ten minutes at which time the test was terminated.

The application rate was selected so that the heat release rate of the fire was reduced, but the fire was never actually extinguished with water. The test report notes that antifreeze solution was completely vaporized and consumed in the flames with little runoff of liquid.

Table 5: SP Test Results, below, outlines the SP test results for propylene glycol, glycerin, and water.

<table>
<thead>
<tr>
<th>Agent</th>
<th>Freezing Point (°F)</th>
<th>Mass Fraction (%)</th>
<th>Density @ 20°C (kg/L)</th>
<th>Total Chemical Energy Released (MJ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>32</td>
<td>---</td>
<td>0.998</td>
<td>357</td>
</tr>
<tr>
<td>Propylene Glycol</td>
<td>5</td>
<td>33.5</td>
<td>1.039</td>
<td>493</td>
</tr>
<tr>
<td>Glycerin</td>
<td>5</td>
<td>39.0</td>
<td>1.098</td>
<td>545</td>
</tr>
<tr>
<td>Glycerin</td>
<td>-22</td>
<td>57.0</td>
<td>1.146</td>
<td>596</td>
</tr>
<tr>
<td>Propylene Glycol</td>
<td>-22</td>
<td>49.0</td>
<td>1.062</td>
<td>629</td>
</tr>
</tbody>
</table>

Table 5: SP Test Results
The conclusions of the SP Report are as follows:

- The contribution of energy to a fire by the antifreeze solution may be a factor that needs to be considered for some sprinkler system applications.

- Antifreeze agent solutions of propylene glycol and glycerin resulted in a significant increase in the heat release rate of the fire relative to the water only tests.

B. FM Research

FM’s research was, in part, a continuation of research conducted by SP. FM conducted a series of tests similar to those of SP. The FM tests compared the effectiveness of various antifreeze-water mixtures by steadily dripping a small amount of these mixtures onto a well-established wood crib fire. Similar to the SP experiments, the reduction in the fire’s heat release rate was recorded.

The wood cribs were approximately 600 grams and were consumed in approximately 10 minutes under free-burn conditions. The cribs were ignited by 50 grams of acetone (igniter fluid) and allowed to free-burn for 4.75 minutes before the antifreeze-water mixture was applied via four drip nozzles (total rate of 0.522 ml/s). The test report notes that there was negligible antifreeze-water runoff while the cribs were burning.

Table 6: FM Test Results, below, summarizes the results of these experiments. The results were later analyzed to evaluate whether antifreeze solutions could be used with ESFR sprinkler systems. Data from the SP fire tests is also included in the table.

<table>
<thead>
<tr>
<th>Agent</th>
<th>FM Data</th>
<th>SP Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Crib Moisture</td>
<td>Avg. HRR</td>
</tr>
<tr>
<td></td>
<td>Content (%)</td>
<td>285-570 s (kW)</td>
</tr>
<tr>
<td>Free Burn</td>
<td>3.7</td>
<td>10.18</td>
</tr>
<tr>
<td>Water</td>
<td>5.4</td>
<td>7.72</td>
</tr>
<tr>
<td>50% Propylene Glycol</td>
<td>5.8</td>
<td>10.18</td>
</tr>
<tr>
<td>35% Propylene Glycol</td>
<td>3.3</td>
<td>9.12</td>
</tr>
</tbody>
</table>

Table 6: FM Test Results

The conclusions of the FM Report were as follows:

- Accounting for the moisture content of the cribs, a 50% propylene glycol solution with water mixture raised the fire’s HRR above that of the free-burn fire.
A 35% propylene glycol solution with water has a neutral effect during the time in which it is replaced by water (roughly comparable to the air initially supplied by a dry pipe system).

This suggests that a 35% propylene glycol solution with water should theoretically perform comparable to a dry pipe sprinkler system.

Propylene glycol antifreeze solutions were found to be unacceptable for use in ESFR fire sprinkler systems due to their performance compared to water.

C. UL Research

1. ESFR Sprinkler Protection of Cold Storage

UL conducted a series of tests to evaluate the effectiveness of ESFR sprinklers in suppressing fires involving Standard Class II commodity using antifreeze solutions. Tests were conducted under a 40 ft ceiling with rack storage heights ranging from 30 to 35 feet. A 50% solution of propylene glycol in water was used in all tests.

Unlike the prior SP and FM research efforts, the UL tests used actual sprinklers and set criteria based on suppression of the fire, instead of comparing the performance of the antifreeze agent to the performance of water. The results of the tests are summarized in the following table.

<table>
<thead>
<tr>
<th>Test</th>
<th>Sprinkler k-factor (gpm/psi^{1/2})</th>
<th>Discharge Rate (gpm)</th>
<th>Storage Height (feet)</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14.0</td>
<td>119</td>
<td>30</td>
<td>Uncontrolled</td>
</tr>
<tr>
<td>2</td>
<td>25.2</td>
<td>160</td>
<td>30</td>
<td>Suppressed</td>
</tr>
<tr>
<td>3</td>
<td>25.2</td>
<td>160</td>
<td>35</td>
<td>Suppressed</td>
</tr>
</tbody>
</table>

Table 7: UL ESFR Cold Storage Test Results

The UL Report indicates the following:

- It is believed that the discharge rate of the sprinkler system must be sufficient to compensate for the combustion energy released by the antifreeze mixture.
- Suppression of the Standard Class II commodity fire with antifreeze solution was achieved by increasing the flow rate of the sprinkler system.

2. Manufactured Home Sprinkler Protection

UL conducted a series of tests for the Federal Emergency Management Agency to investigate sprinkler protection of manufactured (mobile) homes and rural housing.
The research focused on controlling fire conditions using limited water supplies. Total available water supplies of 50 and 100 gallons were investigated. This research was conducted with a sprinkler having a nominal K-factor of 2.0 gpm/psi^{1/2}.

The project considered the impact of 6% wetting agent, 0.3% Class A foam, and 50% glycerin on the effectiveness of a residential sprinkler system. Although rarely used in residential sprinkler systems, the wetting agent and Class A foam were investigated for their ability to improve the effectiveness of the sprinkler system, because faster extinguishment of a fire could reduce the quantity of water needed. Certain tests added glycerin alone or in combination with the wetting agent or foam to investigate the impact of antifreeze on the effectiveness of the sprinkler system for conditions where the water supply may be located in spaces subject to freezing.

Ten fire tests were conducted in a living room/kitchen area measuring 13 feet by 23 feet with a vaulted ceiling. The room was protected with six residential style sprinklers.

A UL 1626 residential fuel package was located in a corner of the room and consisted of a 12 to 13 lb. wood crib with dimensions of 12-inches by 12-inches by 12-inches along with simulated furniture using two 3-inch thick foam cushions measuring 36 inches by 40 inches over wood frames. Instrumentation included the following:

- Temperature at 12 locations throughout the home;
- Activation times of each sprinkler;
- Sprinkler system inlet pressure;
- Smoke density; and
- Carbon monoxide and carbon dioxide concentrations.

Test results were evaluated based on number of sprinklers operated, temperature, carbon monoxide, and carbon dioxide, as well as the following criteria based on UL 1626:

- The maximum temperature 3 inches below the ceiling directly above the wood crib not exceeding 600°F;
- The temperature 63 inches above the floor and 46 inches from the end wall closest to the wood crib not exceeding 200°F at any time and 130°F continuously for more than 2 minutes; and
• The temperature measured ¼-inch behind the ceiling surface, directly above the wood crib not exceeding 500°F.

The results of the UL Manufactured Home tests are outlined in the table below.

<table>
<thead>
<tr>
<th>Test</th>
<th>Solution Type</th>
<th>Quantity (gallons)</th>
<th>Temp. Rating (°F)</th>
<th>Operating Times (mm:ss)</th>
<th>Max. Temp. (°F)</th>
<th>Max. CO Conc. (ppm)</th>
<th>Max. CO2 Conc. (ppm)</th>
<th>Max. CO2 Conc. (ppm)</th>
<th>Light Transmiss (°F)</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Water</td>
<td>100</td>
<td>286</td>
<td>0:59</td>
<td>127</td>
<td>450</td>
<td>9,750</td>
<td>40</td>
<td></td>
<td>Suppressed</td>
</tr>
<tr>
<td>2</td>
<td>Water</td>
<td>100</td>
<td>286</td>
<td>1:07</td>
<td>144</td>
<td>300</td>
<td>9,000</td>
<td>32</td>
<td></td>
<td>Suppressed</td>
</tr>
<tr>
<td>3</td>
<td>Water</td>
<td>50</td>
<td>175</td>
<td>1:04</td>
<td>92</td>
<td>1,400</td>
<td>11,450</td>
<td>47</td>
<td></td>
<td>Not suppressed</td>
</tr>
<tr>
<td>4</td>
<td>50% Glycerin</td>
<td>100</td>
<td>286</td>
<td>0:55</td>
<td>145</td>
<td>1,000</td>
<td>20,000</td>
<td>0</td>
<td>Suppressed, unsteady sprinkler pressure due to pump</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0.3% Class A Foam/50% Glycerin</td>
<td>50</td>
<td>286</td>
<td>1:10, 1:27, 1:50, 2:05</td>
<td>375</td>
<td>4,600</td>
<td>52,000</td>
<td>0</td>
<td>Not suppressed, test discontinued at 2:15</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6% Wetting Agent/50% Glycerin</td>
<td>50</td>
<td>286</td>
<td>1:09</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Not suppressed</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0.3% Class A Foam</td>
<td>50</td>
<td>175</td>
<td>1:26</td>
<td>98</td>
<td>715</td>
<td>N/A</td>
<td>90</td>
<td>Suppressed</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0.3% Class A Foam</td>
<td>50</td>
<td>286</td>
<td>1:03</td>
<td>105</td>
<td>400</td>
<td>4,900</td>
<td>62</td>
<td>Suppressed</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>6% Wetting Agent</td>
<td>50</td>
<td>286</td>
<td>0:57</td>
<td>115</td>
<td>1,150</td>
<td>10,750</td>
<td>58</td>
<td>Suppressed</td>
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<tr>
<td>10</td>
<td>6% Wetting Agent</td>
<td>50</td>
<td>286</td>
<td>1:02</td>
<td>135</td>
<td>440</td>
<td>8,000</td>
<td>41</td>
<td>Suppressed</td>
<td></td>
</tr>
</tbody>
</table>

Table 8: Results of UL Manufactured Home Tests

The conclusions of the UL Manufactured Home test report are as follows:

• Acceptable test results were obtained for tests using 100 gallons of water and the test using 100 gallons of 50% glycerin solution.

• Unacceptable test results were obtained for the test using 50 gallons of water.

• Acceptable tests results were obtained for tests using 50 gallons of 6% wetting
agent and 0.3% Class A foam solution.

- The addition of glycerin to the wetting agent and Class A foam solutions produced unacceptable results.

- It appeared that the glycerin did not permit the wetting agent and Class A foam solutions to spread and penetrate the fire surface as well as in the tests without glycerin.

The following observations are based on comparing the results of the test with a 50% concentration of glycerin in water (Test 4) to the two equivalent tests with water alone (Tests 1 and 2):

- All three tests met the performance criteria for the project.

- Unsteady pump pressures were noted during the test with glycerin that may or may not influence the results.

- The test with glycerin has a measured temperature in the center of the room of fire origin that was comparable to one of the tests with water alone.

- The test with glycerin had measured carbon monoxide and carbon dioxide concentrations in the center of the room of fire origin that were more than double those measured during the tests with water alone.

- The test with glycerin had a measured light transmission near zero, while the two comparable tests with water alone each had a measured light transmission of more than 30 percent.
VI. Research Plan and Near-Term Testing

A research plan was developed to investigate the effectiveness of glycerin and propylene glycol antifreeze solutions in residential fire sprinkler systems. The research plan focuses on three primary areas of concern:

1. The impact of various concentrations of propylene glycol and glycerin antifreeze solutions on the effectiveness of residential sprinkler systems over a range of system pressures and residential fire scenarios.

2. The potential for a flash fire from residential sprinklers supplied with propylene glycol or glycerin under rare conditions.

3. The development of alternative antifreeze solutions for conditions where glycerin and propylene glycol are not found to be suitable.

Fire tests were conducted by Underwriters Laboratories during the development of this report that preliminarily investigated the first two items. Observations from the UL tests and recommendations for future testing are provided below.

A. Near-term Testing on Sprinkler Effectiveness with Antifreeze Solutions

A series of preliminary tests were sponsored and conducted by Underwriters Laboratories during the development of this report. Tests were conducted in UL’s large scale test facility in Northbrook, IL and several of the tests were witnessed by CCI on behalf of the Foundation. This report provides a general summary of observations from the test series. A complete report of the testing is not available at this time and further analysis of the test results should be conducted when the test report is available.

Initial tests were conducted with a small ceiling above an elevated pan of heptane using residential pendant sprinklers with nominal k-factors of 3.1 and 4.9 gpm/psi. The tests used premixed solutions of 70% glycerin and 60% propylene glycol with water. The tests indicated the potential for large-scale ignition of a 70% glycerin solution using a 3.1 k-factor sprinkler at an operating pressure of 100 psi. This large-scale ignition resulted in flames surrounding the majority of the sprinkler spray. A similar large-scale ignition did not occur for initial tests with 60% propylene glycol solutions or tests using a 4.9 k-factor sprinkler at an operating pressure of 50 psi. Analysis of the contribution, if any, of antifreeze solutions to each fire condition should be conducted when the test data is available.

Further tests were conducted in a three sided room measuring approximately 12 feet by 12 feet with a ceiling height of 8 feet. A single sprinkler with a k-factor of 3.1 was located in the center of the ceiling for each test. The majority of the room tests were conducted using a nominal 12-
inch cast-iron pan with cooking oil as the initial fire source. An electric cooktop was used to heat the pan and ignite the cooking oil. One room test was conducted with a pan of heptane as the initial fire instead of the cooking oil. In various tests, the sprinkler was supplied with water only as well as premixed solutions of 70% glycerin, 50% glycerin, and 60% propylene glycol in water. Sprinkler operating pressures of 20, 100, and 150 psi were investigated.

Test results in the room configuration ranged from extinguishment of the fire to large-scale, sustained ignition of the antifreeze solution. Preliminary observations during the tests indicate that the results depend, at a minimum, on a combination of the following factors:

- Location of the initial fire with respect to the sprinkler
- Initial fire source
- Type of sprinkler and operating pressure
- Type and concentration of antifreeze solution

Large-scale, sustained ignition of the 70% glycerin solution supplied at 100 psi occurred when the initial fire was in close proximity to the sprinkler, but the initial fire was controlled using the same concentration of antifreeze at the same operating pressure when the initial fire was located farther from the sprinkler. Large-scale ignition of the 60% propylene glycol solution occurred in the room configuration during a cooking oil fire, but did not occur in the open configuration during a heptane fire. Large-scale ignition of the antifreeze solution did not occur in any of the tests with the 50% glycerin solution. Further investigation of the contribution, if any, of the antifreeze solutions to each fire condition should be conducted when the test data is available.

Preliminary observations during the UL testing indicate the following:

- Large-scale ignition of antifreeze solutions occurred in certain tests for 70% solutions of glycerin and 60% solutions of propylene glycol with water.
- Large-scale ignition of antifreeze solutions of 50% glycerin with water did not occur for any of the tested configurations; further investigation should be conducted for a variety of initial fire sources and test configurations.

Further analysis of the tests should be conducted when the results are available. Preliminary observations from the tests highlight the need for further research into the effectiveness of currently permitted antifreeze solutions and consideration of their suitability for use in sprinkler systems.
B. Future Research

Potential Contribution of Antifreeze Solutions to Fire Conditions

The existing research as well as the recent near-term testing conducted by UL indicate the urgent need for further research into the effectiveness of currently permitted antifreeze solutions. This is based on two concerns:

1. The potential for large-scale ignition of antifreeze solutions; and
2. The potential for antifreeze solutions to reduce the effectiveness of sprinkler systems.

The potential for the large-scale ignition of antifreeze solutions supplied by sprinkler systems involves the following research topics:

- Droplet combustion of a solution of water and propylene glycol or glycerin.
  - Impact of the droplet size distribution, concentration, and spatial distribution on the potential for ignition.
  - Impact of ignition sources on the potential for ignition.
  - Influence of concentration on the potential for ignition and the need to remove water from the solution.

- Residential sprinkler droplet distributions over a range of locations, sprinkler types, liquid types, and operating pressures.

- Potential for an explosion resulting from a flash fire in a confined space.

Existing research into each of these topics has been identified and summarized as part of the literature search. From the discussion above, it is clear that each of the topics is a complicated and contemporary research topic on its own.

Because antifreeze sprinkler systems are currently in use, a practical approach is needed to investigate the potential for large-scale ignition of antifreeze solutions without waiting for the development of each of the research topics identified above.

Although rare, existing research demonstrates the possibility that a large-scale ignition of antifreeze solution may occur under certain circumstances. Factors to be considered include:
• The impact of antifreeze type and concentration.

• Sprinkler type and operating pressures.

• The type, location and duration of the ignition source.

• Potential for an explosion resulting from a flash fire in a confined space.

FM Global Class Number 6930, Approval Standard for Flammability Classification of Industrial Fluid, is intended to investigate the suitability of industrial fluids. This includes an investigation of the flammability of liquid sprays. This standard test method could provide an indication of the potential for ignition of propylene glycol and glycerin antifreeze solutions at various concentrations.

More detailed research specifically addressing the analysis of sprays from residential sprinklers could also be developed, although no standard test method exists for that purpose. The testing program should include an actual residential sprinkler over a range of operating pressures and antifreeze concentrations. This would simulate the range of droplet size distributions and concentrations provided by residential sprinklers. Based on observations from the testing at UL, it is important to test minimum system pressures and higher system pressures due to the complexities in the spray distribution patterns.

Testing should also investigate the impact of antifreeze solutions on maintaining tenable conditions during a fire condition. Standard test methods such as UL 1626, the Standard for Safety for Residential Sprinklers for Fire-Protection Service, could be used to provide criteria for future testing. The testing plan should include a range of operating pressures, sprinklers, and antifreeze concentrations.

A strong ignition source should be used to increase the potential for ignition and the ignition source should be moved to a variety of locations with respect to the sprinkler. Care should be taken in conducting such testing, as the purpose of the testing is to investigate whether a flash fire or deflagration could occur. Multiple ignition sources should be considered including, solid fuel fires, combustible liquids and hot surfaces (e.g. electric burners and heaters).

Other Antifreeze Solutions Permitted by NFPA 13

Antifreeze solutions other than propylene glycol and glycerin were not included in this literature review. However, NFPA 13 also permits the use of diethylene glycol and ethylene glycol in certain sprinkler systems. These additional antifreeze solutions have similar properties to those of propylene glycol and glycerin.
Table 9, below, outlines properties of all of the antifreeze solutions permitted by NFPA 13. One notable comparison is the flashpoint of diethylene glycol (255°F) to that of propylene glycol (210°F) and glycerin (390°F). It was observed during the recent preliminary fire tests conducted by UL that a solution of 70% glycerin with water under certain circumstances may result in large-scale ignition of the antifreeze solution. Given that the flash point of diethylene glycol is less than the flash point of glycerin, additional research should be conducted to analyze the combustibility of diethylene glycol solutions supplied through sprinkler systems.

Another notable comparison is that the autoignition temperature of diethylene glycol (435°F) is significantly lower than that of the other antifreeze solutions permitted by NFPA 13. Because the flash points and autoignition temperatures of diethylene glycol and ethylene glycol are similar to those of propylene glycol and glycerin, additional research should be conducted to analyze the combustibility of diethylene glycol and ethylene glycol solutions supplied through sprinkler systems.

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Flammable Limits in Air (% by volume) Lower/Upper</th>
<th>Flash Point (°F)</th>
<th>Autoignition Temperature (°F)</th>
<th>Boiling Point (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propylene Glycol</td>
<td>2.6 / 12.5</td>
<td>210</td>
<td>700</td>
<td>370</td>
</tr>
<tr>
<td>Glycerin</td>
<td>Not Provided / Not Provided</td>
<td>390</td>
<td>698</td>
<td>340</td>
</tr>
<tr>
<td>Diethylene Glycol</td>
<td>Not Provided / Not Provided</td>
<td>255</td>
<td>435</td>
<td>472</td>
</tr>
<tr>
<td>Ethylene Glycol</td>
<td>3.2 / Not Provided</td>
<td>232</td>
<td>748</td>
<td>387</td>
</tr>
</tbody>
</table>

Table 9: Properties of Pure Antifreeze Solutions Permitted by NFPA 13

Alternative Antifreeze Solutions

In consideration of the potential limitations of antifreeze solutions currently permitted by NFPA 13, alternative antifreeze solutions should be researched as a potential replacement for the existing options. Ideally, the new antifreeze solution would be non-combustible, provide an adequate freezing point, be non-toxic, not be cost prohibitive, and not have material compatibility issues.
VII. Summary

NFPA 13, 13D and 13R permit the use of antifreeze solutions in fire sprinkler systems that are exposed to freezing conditions. In pure form, propylene glycol and glycerin (both permitted by NFPA 13, 13D and 13R) are Class IIIB Combustible Liquids. A literature search has been conducted to investigate impact of antifreeze solutions on the effectiveness of residential sprinkler systems.

Existing research and testing suggests that the combustibility characteristics of antifreeze-water mixtures in droplet form are not completely characterized by standardized test methods for flash point or autoignition temperature. Under certain conditions, atomized antifreeze-water mixtures can combust when sprayed onto an ignition source. Increasing the concentration of the antifreeze in the antifreeze-water solution increases the combustibility of the solution. Additionally, existing research indicates that under certain conditions, the energy release rate of some fires increases upon interaction with antifreeze-water mixtures.

Recent testing conducted at UL indicates that under certain conditions a large-scale ignition is possible from the discharge of a sprinkler system containing solutions of 70% glycerin or 60% propylene glycol in water onto certain ignition sources. This result is dependent on the characteristics of the fuel source, the spray distribution pattern of the antifreeze-water mixture, the pressure of the system, the type of sprinkler, the location of the fire relative to the sprinkler and the concentration of the antifreeze solution in the mixture. Future testing is recommended to analyze the ignition of antifreeze-water mixtures in droplet form. This is important due to the unique combustibility characteristics of antifreeze-water mixtures when atomized during sprinkler discharge.

Research is also recommended to investigate the combustibility of diethylene glycol and ethylene glycol solutions with water (antifreeze solutions also permitted by NFPA 13, 13D and 13R). The flash points and autoignition temperatures of diethylene glycol and ethylene glycol are comparable to those of propylene glycol and glycerin. As such, the combustibility of these solutions should also be addressed.

Existing research indicates that under certain conditions the energy released during a fire condition could increase upon interaction with certain antifreeze solutions currently permitted by NFPA 13, 13D and 13R. Further research is recommended to investigate the effectiveness of antifreeze solutions used in sprinkler systems. Specifically, the ability of antifreeze solutions to control a fire and maintain tenable conditions should be investigated. Additionally, the recent testing conducted by UL demonstrates that, under certain conditions, a large-scale sustained ignition is possible from the discharge of certain sprinkler systems containing antifreeze solutions. Further testing is required to more completely investigate the potential for large-scale ignition or flash fires from antifreeze solutions. Based on the known characteristics of ethylene
glycol and diethylene glycol, additional research should also address their suitability for use in sprinkler systems. An alternative antifreeze solution should also be investigated for conditions where the solutions that are currently permitted are not found to be suitable.
VIII. References

1 National Board of Fire Underwriters, NBFU Pamphlet No. 13: Standards of the National Board of Fire Underwriters for the Installation of Sprinkler Equipments as recommended by the National Fire Protection Association, Chicago (1940 ed.).


9 Putorti, A.D., Simultaneous Measurements of Drop Size and Velocity in Large-Scale Sprinkler Flows Using Particle Tracking and Laser-Induced Fluorescence, National Institute of Standards and Technology, Gaithersburg, MD (2004).


17 National Fire Protection Association, Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 497, Quincy, MA (2008 ed.).


Fire Test Data Summary for Residential Sprinklers Discharging Antifreeze Mixtures

Project Number: SR5882864
File Number: Subject 1626

Underwriters Laboratories Inc.
333 Pfingsten Road, Northbrook, IL 60062

May 26, 2010

Prepared by: 
Daniel Steppan
Staff Engineer
Building Materials & Systems

Reviewed by: 
Kerry M. Bell
Primary Designated Engineer
Fire Sprinkler & Pump Equipment

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General

This fire test data summary is intended for distribution to the National Fire Protection Association (NFPA) Technical Correlating Committee (TCC) on Automatic Sprinkler Systems solely for their use related to the consideration of requirements referenced in the applicable NFPA design, installation and maintenance standards.

This UL funded research effort was intended to generate fire test data on residential style sprinklers discharging water compared to glycerin and propylene glycol antifreeze mixtures using two different fire sources, heptane and canola oil, in an open area and semi-enclosed structure.

Acknowledgements

UL wishes acknowledge and express deep appreciation for the contributions of The Viking Corporation who provided the portable pump system and the antifreeze mixtures that were used for this test series. Also, Mr. Shawn Orr and Mr. Scott Franson of The Viking Corporation provided extraordinary assistance in the planning and execution of these tests.
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<td>34</td>
<td>Test 9 W Center Tree</td>
<td>31</td>
</tr>
<tr>
<td>35</td>
<td>Test 9 NW Tree</td>
<td>32</td>
</tr>
<tr>
<td>36</td>
<td>Test 9 NE Tree</td>
<td>32</td>
</tr>
<tr>
<td>37</td>
<td>Test 10 Sprinkler and Ignition Temperatures</td>
<td>33</td>
</tr>
<tr>
<td>38</td>
<td>Test 10 SE Tree</td>
<td>33</td>
</tr>
<tr>
<td>39</td>
<td>Test 10 SW Tree</td>
<td>34</td>
</tr>
<tr>
<td>40</td>
<td>Test 10 W Center Tree</td>
<td>34</td>
</tr>
<tr>
<td>41</td>
<td>Test 10 NW Tree</td>
<td>35</td>
</tr>
<tr>
<td>42</td>
<td>Test 10 NE Tree</td>
<td>35</td>
</tr>
</tbody>
</table>
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| Figure 46 – Test 11 W Center Tree | 37 |
| Figure 47 – Test 11 NW Tree | 38 |
| Figure 48 – Test 11 NE Tree | 38 |
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| Figure 51 – Test 12 SW Tree | 40 |
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| Figure 53 – Test 12 NW Tree | 41 |
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| Figure 59 – Test 13 NW Tree | 44 |
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| Figure 65 – Test 14 NW Tree | 47 |
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## TABLE 1
SUMMARY OF OPEN AREA FIRE TESTS

<table>
<thead>
<tr>
<th>TEST DATE</th>
<th>5/14/10</th>
<th>5/14/10</th>
<th>5/17/10</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST DATE</td>
<td>5/14/10</td>
<td>5/14/10</td>
<td>5/17/10</td>
</tr>
<tr>
<td>FIRE TEST NUMBER</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>PARAMETERS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel for Fire</td>
<td>Heptane</td>
<td>Heptane</td>
<td>Heptane</td>
</tr>
<tr>
<td>Test Configuration</td>
<td>Figures 1 &amp; 2</td>
<td>Figures 1 &amp; 2</td>
<td>Figures 1 &amp; 2</td>
</tr>
<tr>
<td>Liquid Discharged from Sprinkler</td>
<td>Factory Mixed Glycerin</td>
<td>Factory Mixed Glycerin</td>
<td>Factory Mixed Propylene Glycol</td>
</tr>
<tr>
<td>Antifreeze Concentration, %</td>
<td>70/30</td>
<td>70/30</td>
<td>60/40</td>
</tr>
<tr>
<td>Nominal Dimensions of Steel Pan for Fuel, cm (in)</td>
<td>69 by 69 by 30 high (27 by 27 by 12)</td>
<td>69 by 69 by 30 high (27 by 27 by 12)</td>
<td>69 by 69 by 30 high (27 by 27 by 12)</td>
</tr>
<tr>
<td>Nominal Depth of Water, mm (in)</td>
<td>102 (4)</td>
<td>102 (4)</td>
<td>102 (4)</td>
</tr>
<tr>
<td>Nominal Depth of Heptane, mm (in)</td>
<td>51 (2)</td>
<td>51 (2)</td>
<td>51 (2)</td>
</tr>
<tr>
<td>Nominal Ceiling Height, m (ft)</td>
<td>2.4 (8)</td>
<td>2.4 (8)</td>
<td>2.4 (8)</td>
</tr>
<tr>
<td>Ceiling Dimensions, m by m (ft by ft)</td>
<td>3.1 by 3.7 (10 by 12)</td>
<td>3.1 by 3.7 (10 by 12)</td>
<td>3.1 by 3.7 (10 by 12)</td>
</tr>
<tr>
<td>Top of Pan to Ceiling, m (in)</td>
<td>1.7 (46)</td>
<td>1.7 (46)</td>
<td>1.7 (46)</td>
</tr>
<tr>
<td>Horizontal Distance from Sprinkler to Pan Edge, cm (in)</td>
<td>61 (24)</td>
<td>61 (24)</td>
<td>61 (24)</td>
</tr>
<tr>
<td>Sprinkler Orientation</td>
<td>Recessed Pendent</td>
<td>Recessed Pendent</td>
<td>Recessed Pendent</td>
</tr>
<tr>
<td>Temperature Rating, °C (°F)</td>
<td>68 (155)</td>
<td>68 (155)</td>
<td>68 (155)</td>
</tr>
<tr>
<td>Sprinkler Type</td>
<td>Residential</td>
<td>Residential</td>
<td>Residential</td>
</tr>
<tr>
<td>Nominal K-factor, lpm/bar (^\text{1/2}) (gpm/psi (^\text{1/2}))</td>
<td>72 (4.9)</td>
<td>45 (3.1)</td>
<td>45 (3.1)</td>
</tr>
<tr>
<td>Nominal Discharge Pressure, bar (psig)</td>
<td>3.4 (50)</td>
<td>6.9 (100)</td>
<td>6.9 (100)</td>
</tr>
</tbody>
</table>

### RESULTS

| Sprinkler Operation After Ignition, min:s | 0:10 | 0:08 | 0:10 |
| Duration of Sprinkler Discharge, min:s | 5:55 | 1:25 | 1:56 |

### Visual Observations of Fire Behavior

- **Sprinkler Operation After Ignition:** The fire size at sprinkler operation increased somewhat and then remained relatively steady throughout the test. After termination of sprinkler discharge, the heptane fire continued to burn until manually extinguished.
- **Sprinkler Discharge:** After sprinkler operation, the antifreeze mixture was observed to ignite and create a large spray type fire from the sprinkler discharge. This fire was sustained until the sprinkler discharge was terminated. After termination of sprinkler discharge, the heptane fire continued to burn until manually extinguished. The size of the fire plume size varied after sprinkler operation. Occasionally, it appeared that portions of the antifreeze mixture discharged from the sprinkler ignited for brief time periods, but the fire was eventually extinguished at 72 sec after the start of sprinkler discharge.
### TABLE 1 (Cont.)
#### SUMMARY OF OPEN AREA FIRE TESTS

<table>
<thead>
<tr>
<th>TEST DATE</th>
<th>5/17/10</th>
<th>5/24/10</th>
<th>5/25/10</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRE TEST NUMBER</td>
<td>4</td>
<td>16</td>
<td>17</td>
</tr>
</tbody>
</table>

#### PARAMETERS

<table>
<thead>
<tr>
<th>Fuel for Fire</th>
<th>Heptane</th>
<th>Heptane</th>
<th>Heptane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Configuration</td>
<td>Figures 1 &amp; 2</td>
<td>Figures 1 &amp; 2</td>
<td>Figures 1 &amp; 2</td>
</tr>
<tr>
<td>Liquid Discharged from Sprinkler</td>
<td>Factory Mixed Glycerin</td>
<td>Factory Mixed Glycerin</td>
<td>Water</td>
</tr>
<tr>
<td>Antifreeze Concentration, %</td>
<td>70/30</td>
<td>50/50</td>
<td>N/A</td>
</tr>
<tr>
<td>Nominal Dimensions of Steel Pan for Fuel, cm (in)</td>
<td>69 by 69 by 30 high (27 by 27 by 12)</td>
<td>69 by 69 by 30 high (27 by 27 by 12)</td>
<td>69 by 69 by 30 high (27 by 27 by 12)</td>
</tr>
<tr>
<td>Nominal Depth of Water, mm (in)</td>
<td>102 (4)</td>
<td>102 (4)</td>
<td>102 (4)</td>
</tr>
<tr>
<td>Nominal Depth of Heptane, mm (in)</td>
<td>51 (2)</td>
<td>51 (2)</td>
<td>51 (2)</td>
</tr>
<tr>
<td>Nominal Ceiling Height, m (ft)</td>
<td>2.4 (8)</td>
<td>2.4 (8)</td>
<td>2.4 (8)</td>
</tr>
<tr>
<td>Ceiling Dimensions, m by m (ft by ft) (10 by 12)</td>
<td>3.1 by 3.7</td>
<td>3.1 by 3.7</td>
<td>3.1 by 3.7</td>
</tr>
<tr>
<td>Top of Pan to Ceiling, m (in)</td>
<td>1.7 (46)</td>
<td>1.7 (46)</td>
<td>1.7 (46)</td>
</tr>
<tr>
<td>Horizontal Distance from Sprinkler to Pan Edge, cm (in)</td>
<td>61 (24)</td>
<td>61 (24)</td>
<td>61 (24)</td>
</tr>
<tr>
<td>Sprinkler Orientation</td>
<td>Recessed Pendent</td>
<td>Recessed Pendent</td>
<td>Recessed Pendent</td>
</tr>
<tr>
<td>Temperature Rating, °C (°F)</td>
<td>68 (155)</td>
<td>68 (155)</td>
<td>68 (155)</td>
</tr>
<tr>
<td>Sprinkler Type</td>
<td>Residential</td>
<td>Residential</td>
<td>Residential</td>
</tr>
<tr>
<td>Nominal K-factor, lpm/bar ½ (gpm/psi ½)</td>
<td>45 (3.1)</td>
<td>45 (3.1)</td>
<td>45 (3.1)</td>
</tr>
<tr>
<td>Nominal Discharge Pressure, bar (psig)</td>
<td>6.9(100)</td>
<td>6.9 (100)</td>
<td>6.9 (100)</td>
</tr>
</tbody>
</table>

#### RESULTS

<table>
<thead>
<tr>
<th>Sprinkler Operation After Ignition, min:s</th>
<th>0:11</th>
<th>0:08</th>
<th>0:10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of Sprinkler Discharge, min:s</td>
<td>1:52</td>
<td>2:00</td>
<td>2:00</td>
</tr>
</tbody>
</table>

#### Visual Observations of Fire Behavior

- **Sprinkler Operation After Ignition, min:s**: After sprinkler operation, the antifreeze mixture was observed to ignite and create a large spray type fire from the sprinkler discharge. This fire was sustained until the sprinkler discharge was terminated. After termination of sprinkler discharge, the heptane fire continued to burn until manually extinguished.
- **Duration of Sprinkler Discharge, min:s**: After sprinkler operation, the fire was pushed in a direction away from the sprinkler discharge. The size of the fire then remained relatively steady throughout the test. No sustained ignition of the antifreeze discharge was observed. After termination of sprinkler discharge, the heptane fire continued to burn until manually extinguished.
## TABLE 2
### SUMMARY OF 12 FT by 12 FT BY 8 FT. HIGH, 3-SIDED ENCLOSURE FIRE TESTS

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Test Date 5/18/10</th>
<th>Test Date 5/19/10</th>
<th>Test Date 5/19/10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fuel for Fire</strong></td>
<td>Canola Cooking Oil</td>
<td>Canola Cooking Oil</td>
<td>Heptane</td>
</tr>
<tr>
<td><strong>Test Configuration</strong></td>
<td>Figures 3 &amp; 4</td>
<td>Figures 3 &amp; 5</td>
<td>Figures 3 &amp; 5</td>
</tr>
<tr>
<td><strong>Liquid Discharged from Sprinkler</strong></td>
<td>Factory Mixed Glycerin</td>
<td>Factory Mixed Glycerin</td>
<td>Factory Mixed Glycerin</td>
</tr>
<tr>
<td><strong>Antifreeze Concentration, %</strong></td>
<td>70/30</td>
<td>70/30</td>
<td>50/50</td>
</tr>
<tr>
<td><strong>Fuel Vessel Description and Dimensions, cm (in)</strong></td>
<td>30 (12) diameter by 5.1 (2) high cast iron skillet heated by a coil-type electric stovetop</td>
<td>30 (12) diameter by 5.1 (2) high cast iron skillet heated by a coil-type electric stovetop</td>
<td>30 (12) by 30 (12) by 10.2 (4) high steel pan</td>
</tr>
<tr>
<td><strong>Nominal Depth of Water, cm (in)</strong></td>
<td>N/A</td>
<td>N/A</td>
<td>25.4 (1)</td>
</tr>
<tr>
<td><strong>Nominal Depth of Fuel, mm (in)</strong></td>
<td>25.4 (1)</td>
<td>25.4 (1)</td>
<td>25.4 (1)</td>
</tr>
<tr>
<td><strong>Nominal Ceiling Height, m (ft)</strong></td>
<td>2.4 (8)</td>
<td>2.4 (8)</td>
<td>2.4 (8)</td>
</tr>
<tr>
<td><strong>Top of Skillet to Ceiling, m (in)</strong></td>
<td>1.6 (63)</td>
<td>1.6 (63)</td>
<td>1.6 (63)</td>
</tr>
<tr>
<td><strong>Horizontal Distance from Sprinkler to Skillet Edge, cm (in)</strong></td>
<td>137 (54)</td>
<td>61 (24)</td>
<td>61 (24)</td>
</tr>
<tr>
<td><strong>Sprinkler Orientation</strong></td>
<td>Recessed Pendent</td>
<td>Recessed Pendent</td>
<td>Recessed Pendent</td>
</tr>
<tr>
<td><strong>Temperature Rating, °C (°F)</strong></td>
<td>68 (155)</td>
<td>68 (155)</td>
<td>68 (155)</td>
</tr>
<tr>
<td><strong>Sprinkler Type</strong></td>
<td>Residential</td>
<td>Residential</td>
<td>Residential</td>
</tr>
<tr>
<td><strong>Nominal K-factor, lpm/bar l/2 (gpm/psi l/2)</strong></td>
<td>45</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td><strong>Nominal Discharge Pressure, bar (psig)</strong></td>
<td>6.9 (100)</td>
<td>6.9 (100)</td>
<td>6.9 (100)</td>
</tr>
</tbody>
</table>

### RESULTS

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Value</th>
<th>Value</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil Temperature at Auto Ignition, °C (°F)</td>
<td>371 (700)</td>
<td>370 (698)</td>
<td>N/A</td>
</tr>
<tr>
<td>Sprinkler Operation After Ignition, min:sec</td>
<td>2:20</td>
<td>2:00</td>
<td>0:45</td>
</tr>
<tr>
<td>Duration of Sprinkler Discharge, min:sec</td>
<td>4:56</td>
<td>1:00</td>
<td>2:30</td>
</tr>
<tr>
<td>Maximum Temperature at 76 mm (3 in) Below Ceiling</td>
<td>108 (227) @ NE Corner</td>
<td>693 (1279) @ NW Corner</td>
<td>62 (144) @ NW Corner</td>
</tr>
<tr>
<td>Maximum Temperature at 61 cm (24 in) Below Ceiling</td>
<td>36 (97) @ SE Corner</td>
<td>850 (1562) @ NW Corner</td>
<td>50 (122) @ SE Corner</td>
</tr>
<tr>
<td>Maximum Temperature at 1.6 m (63 in) Above Floor</td>
<td>34 (93) @ SE Corner</td>
<td>732 (1350) @ NW Corner</td>
<td>49 (120) @ SE Corner</td>
</tr>
</tbody>
</table>

### Visual Observations of Fire Behavior

- The fire size was reduced after sprinkler discharge and was extinguished within 30 sec prior to the end of sprinkler discharge. A small area of thermal damage on the plywood near the skillet was observed.
- After sprinkler operation, the antifreeze mixture was observed to ignite and create a large spray type fire from sprinkler discharge that extended outside the room lintel. The flash fire was sustained until the sprinkler discharge was terminated. The canola oil fire was extinguished during sprinkler discharge.
- The fire size at sprinkler operation remained controlled and relatively steady throughout the test. No ignition of the antifreeze was observed. After the sprinkler discharge was terminated, the heptane fire was manually extinguished.
### TABLE 2 (Cont.)

**SUMMARY OF 12 FT by 12 FT BY 8 FT. HIGH, 3-SIDED ENCLOSURE FIRE TESTS**

<table>
<thead>
<tr>
<th>TEST DATE</th>
<th>FIRE TEST NUMBER</th>
<th>5/19/10</th>
<th>5/20/10</th>
<th>5/20/10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PARAMETERS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel for Fire</td>
<td>Canola Cooking Oil</td>
<td>Canola Cooking Oil</td>
<td>Canola Cooking Oil</td>
<td></td>
</tr>
<tr>
<td>Test Configuration</td>
<td>Figures 3 &amp; 5</td>
<td>Figures 3 &amp; 5</td>
<td>Figures 3 &amp; 5</td>
<td></td>
</tr>
<tr>
<td>Liquid Discharged from Sprinkler</td>
<td>Factory Mixed Glycerin</td>
<td>Water</td>
<td>Factory Mixed Propylene Glycol</td>
<td></td>
</tr>
<tr>
<td>Antifreeze Concentration, %</td>
<td>50/50</td>
<td>N/A</td>
<td>60/40</td>
<td></td>
</tr>
<tr>
<td>Fuel Vessel Description and Dimensions, cm (in)</td>
<td>30 (12) diameter by 5.1 (2) high cast iron skillet heated by a coil-type electric stovetop</td>
<td>30 (12) diameter by 5.1 (2) high cast iron skillet heated by a coil-type electric stovetop</td>
<td>30 (12) diameter by 5.1 (2) high cast iron skillet heated by a coil-type electric stovetop</td>
<td></td>
</tr>
<tr>
<td>Nominal Depth of Water, cm (in)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Nominal Depth of Fuel, mm (in)</td>
<td>25.4 (1)</td>
<td>25.4 (1)</td>
<td>25.4 (1)</td>
<td></td>
</tr>
<tr>
<td>Nominal Ceiling Height, m (ft)</td>
<td>2.4 (8)</td>
<td>2.4 (8)</td>
<td>2.4 (8)</td>
<td></td>
</tr>
<tr>
<td>Top of Skillet to Ceiling, m (in)</td>
<td>1.6 (63)</td>
<td>1.6 (63)</td>
<td>1.6 (63)</td>
<td></td>
</tr>
<tr>
<td>Horizontal Distance from Sprinkler to Skillet Edge, cm (in)</td>
<td>61 (24)</td>
<td>61 (24)</td>
<td>61 (24)</td>
<td></td>
</tr>
<tr>
<td>Sprinkler Orientation</td>
<td>Recessed Pendent</td>
<td>Recessed Pendent</td>
<td>Recessed Pendent</td>
<td></td>
</tr>
<tr>
<td>Temperature Rating, °C (°F)</td>
<td>68 (155)</td>
<td>68 (155)</td>
<td>68 (155)</td>
<td></td>
</tr>
<tr>
<td>Sprinkler Type</td>
<td>Residential</td>
<td>Residential</td>
<td>Residential</td>
<td></td>
</tr>
<tr>
<td>Nominal K-factor, lpm/bar (gpm/psi)</td>
<td>45 (3.1)</td>
<td>45 (3.1)</td>
<td>45 (3.1)</td>
<td></td>
</tr>
<tr>
<td>Nominal Discharge Pressure, bar (psig)</td>
<td>6.9 (100)</td>
<td>6.9 (100)</td>
<td>6.9 (100)</td>
<td></td>
</tr>
<tr>
<td><strong>RESULTS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil Temperature at Auto Ignition, °C (°F)</td>
<td>364 (687)</td>
<td>365 (689)</td>
<td>365 (689)</td>
<td></td>
</tr>
<tr>
<td>Sprinkler Operation After Ignition, min:sec</td>
<td>2:12</td>
<td>2:10</td>
<td>2:03</td>
<td></td>
</tr>
<tr>
<td>Duration of Sprinkler Discharge, min:sec</td>
<td>1:05</td>
<td>1:20</td>
<td>1:28</td>
<td></td>
</tr>
<tr>
<td>Maximum Temperature at 76 mm (3 in) Below Ceiling</td>
<td>@ SW Corner 172 (342)</td>
<td>@ NE Corner 138 (280)</td>
<td>@ SW Corner 450 (842)</td>
<td></td>
</tr>
<tr>
<td>Maximum Temperature at 61 cm (24 in) Below Ceiling</td>
<td>@ NE Corner 52 (126)</td>
<td>@ SE Corner 46 (115)</td>
<td>276 (529)</td>
<td>@ SE Corner</td>
</tr>
<tr>
<td>Maximum Temperature at 1.6 m (63 in) Above Floor</td>
<td>@ NE Corner 50 (122)</td>
<td>@ SE Corner 45 (113)</td>
<td>280 (536)</td>
<td>@ SE Corner</td>
</tr>
<tr>
<td><strong>Visual Observations of Fire Behavior</strong></td>
<td>After sprinkler operation, an initial increase in the size of the fire was observed for limited duration of approximately 10 sec. No flames were observed to extend beyond the room lintel. Fire extinguishment occurred at approximately 53 seconds after the start of sprinkler discharge.</td>
<td>After sprinkler operation, an initial increase in size of the fire was observed for limited duration of approximately 14 sec. No flames were observed to extend beyond the room lintel. Fire extinguishment occurred at approximately 20 seconds after the start of sprinkler discharge.</td>
<td>After sprinkler operation, the antifreeze mixture was observed to ignite and create a large spray type fire from the sprinkler discharge that extended outside the room lintel for approximately 20 sec. The oil fire appeared to be extinguished close to the same time as the spray fire ceased.</td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 2 (Cont.)
SUMMARY OF 12 FT by 12 FT BY 8 FT. HIGH, 3-SIDED ENCLOSURE FIRE TESTS

<table>
<thead>
<tr>
<th>TEST DATE</th>
<th>5/20/10</th>
<th>5/21/10</th>
<th>5/21/10</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRE TEST NUMBER</td>
<td>11</td>
<td>12</td>
<td>13</td>
</tr>
</tbody>
</table>

**PARAMETERS**

| Fuel for Fire | Canola Cooking Oil | Canola Cooking Oil | Canola Cooking Oil |
| Test Configuration | Figures 3 & 5 | Figures 3 & 5 | Figures 3 & 5 |
| Liquid Discharged from Sprinkler | Factory Mixed Glycerin | Factory Mixed Glycerin | Water |
| Antifreeze Concentration, % | 50/50 | 50/50 | N/A |
| Fuel Vessel Description and Dimensions, cm (in) | 30 (12) diameter by 5.1 (2) high cast iron skillet heated by a coil-type electric stovetop | 30 (12) diameter by 5.1 (2) high cast iron skillet heated by a coil-type electric stovetop | 30 (12) diameter by 5.1 (2) high cast iron skillet heated by a coil-type electric stovetop |
| Nominal Depth of Water, cm (in) | N/A | N/A | N/A |
| Nominal Depth of Fuel, mm (in) | 25.4 (1) | 25.4 (1) | 25.4 (1) |
| Nominal Ceiling Height, m (ft) | 2.4 (8) | 2.4 (8) | 2.4 (8) |
| Top of Skillet to Ceiling, m (in) | 1.6 (63) | 1.6 (63) | 1.6 (63) |
| Horizontal Distance from Sprinkler to Skillet Edge, cm (in) | 61 (24) | 61 (24) | 61 (24) |
| Sprinkler Orientation | Recessed Pendent | Recessed Pendent | Recessed Pendent |
| Temperature Rating, °C (°F) | 68 (155) | 68 (155) | 68 (155) |
| Sprinkler Type | Residential | Residential | Residential |
| Nominal K-factor, lpm/bar ½ (gpm/psi ½) | 45 (3.1) | 45 (3.1) | 45 (3.1) |
| Nominal Discharge Pressure, bar (psig) | 10.3 (150) | 1.4 (20) | 1.4 (20) |

**RESULTS**

| Oil Temperature at Auto Ignition, °C (°F) | 366 (691) | 366 (691) | 365 (689) |
| Sprinkler Operation After Ignition, min:sec | 2:06 | 2:05 | 2:02 |
| Duration of Sprinkler Discharge, min:sec | 1:26 | 4:00 | 3:00 |
| Maximum Temperature at 76 mm (3 in) Below Ceiling @ NE Corner | 79 (174) | 104 (219) | 101 (214) |
| Maximum Temperature at 61 cm (24 in) Below Ceiling @ SE Corner | 51 (124) | 33 (92) | 35 (95) |
| Maximum Temperature at 1.6 m (63 in) Above Floor @ NE Corner | 50 (122) | 29 (84) | 32 (90) |
| Visual Observations of Fire Behavior | After sprinkler operation, an initial increase in the size of the fire was observed for limited duration of approximately 15 sec. No flames were observed to extend beyond the room lintel. Fire extinguishment occurred at approximately 75 seconds after the start of sprinkler discharge. | The fire size at sprinkler operation was visually observed to increase slightly upon sprinkler discharge and then remain controlled with a stable or decreasing intensity until extinguishment occurred at approximately 180 sec after sprinkler operation. | The fire size at sprinkler operation was observed to increase slightly upon sprinkler discharge and then remain controlled with a stable or decreasing intensity until the oil was consumed. Fire extinguishment occurred at the time the oil was fully consumed which was 132 sec after the start of discharge. |
### TABLE 2 (Cont.)

**SUMMARY OF 12 FT by 12 FT BY 8 FT. HIGH, 3-SIDED ENCLOSURE FIRE TESTS**

<table>
<thead>
<tr>
<th>TEST DATE</th>
<th>5/21/10</th>
<th>5/24/10</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRE TEST NUMBER</td>
<td>14</td>
<td>15</td>
</tr>
</tbody>
</table>

#### PARAMETERS

<table>
<thead>
<tr>
<th>Fuel for Fire</th>
<th>Canola Cooking Oil</th>
<th>Canola Cooking Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Configuration</td>
<td>Figures 3 &amp; 6</td>
<td>Figures 3 &amp; 6</td>
</tr>
<tr>
<td>Liquid Discharged from Sprinkler</td>
<td>Factory Mixed Glycerin</td>
<td>Water</td>
</tr>
<tr>
<td>Antifreeze Concentration, %</td>
<td>50/50</td>
<td>N/A</td>
</tr>
<tr>
<td>Fuel Vessel Description and Dimensions, cm (in)</td>
<td>30 (12) diameter by 5.1 (2) high cast iron skillet heated by a coil-type electric stovetop</td>
<td>30 (12) diameter by 5.1 (2) high cast iron skillet heated by a coil-type electric stovetop</td>
</tr>
<tr>
<td>Nominal Depth of Water, cm (in)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Nominal Depth of Fuel, mm (in)</td>
<td>25.4 (1)</td>
<td>25.4 (1)</td>
</tr>
<tr>
<td>Nominal Ceiling Height, m (ft)</td>
<td>2.4 (8)</td>
<td>2.4 (8)</td>
</tr>
<tr>
<td>Top of Skillet to Ceiling, m (in)</td>
<td>1.6 (63)</td>
<td>1.6 (63)</td>
</tr>
<tr>
<td>Horizontal Distance from Sprinkler to Skillet Edge, cm (in)</td>
<td>46 (18)</td>
<td>46 (18)</td>
</tr>
<tr>
<td>Sprinkler Orientation</td>
<td>Recessed Pendent</td>
<td>Recessed Pendent</td>
</tr>
<tr>
<td>Temperature Rating, °C (°F)</td>
<td>68 (155)</td>
<td>68 (155)</td>
</tr>
<tr>
<td>Sprinkler Type</td>
<td>Residential</td>
<td>Residential</td>
</tr>
<tr>
<td>Nominal K-factor, lpm/bar (gpm/psi)</td>
<td>45 (3.1)</td>
<td>45 (3.1)</td>
</tr>
<tr>
<td>Nominal Discharge Pressure, bar (psig)</td>
<td>10.3 (150)</td>
<td>10.3 (150)</td>
</tr>
</tbody>
</table>

#### RESULTS

| Oil Temperature at Auto Ignition, °C (°F) | 362 (684) | 369 (696) |
| Sprinkler Operation After Ignition, min:sec | 2:06 | 1:40 |
| Duration of Sprinkler Discharge, min:sec | 0:55 | 1:12 |
| Maximum Temperature at 76 mm (3 in) Below Ceiling @ NE Corner | 127 (261) | 153 (307) |
| Maximum Temperature at 61 cm (24 in) Below Ceiling @ SE Corner | 57 (135) | 60 (140) |
| Maximum Temperature at 1.6 m (63 in) Above Floor @ SE Corner | 55 (131) | 57 (135) |

**Visual Observations of Fire Behavior**

- **Test 14:**
  - After sprinkler operation, an initial increase in the size of the fire was observed during the first 10 seconds of discharge that caused flames to extend beyond the room lintel on two occasions each lasting for approximately 1 second. Fire extinguishment occurred at approximately 30 sec after the start of sprinkler discharge.

- **Test 15:**
  - After sprinkler operation, an initial increase in intensity and size of the fire was observed for limited duration of approximately 30 sec. No flames were observed to extend beyond the room lintel. Fire extinguishment occurred at approximately 36 seconds after the start of sprinkler discharge.
Figure 1 – Open Area Elevation View (Tests 1 – 4, 16 and 17)
TEST DIAGRAMS (Cont.)

3.05 m by 3.69 m (10 ft. by 12 ft.) ceiling, suspended 2.4 m (8 ft.) off the ground.

Recessed Pendent Residential Sprinkler - Centered on Ceiling

0.61 m (2 ft.) gap between sprinkler and pan centerline

UL 711; 2-B Flammable Liquid Test Pan 0.47 m² (5 ft²)
Positioned 0.97 m (38 inches) off test room floor

Figure 2 – Open Area Plan View (Tests 1 – 4, 16 and 17)
TEST DIAGRAMS (Cont.)

Figure 3 – Enclosure Testing Elevation View (Tests 5 through 15)

- 2.4 m (8 ft.) tall by 3.7 m (12 ft.) long enclosure
- 0.2 m (8 in.) deep lintel
- 1.60 m (63 in.)
- 0.79 m (31 in.)
- Recessed Pendent Sprinkler
- Centerline of Room
TEST DIAGRAMS (Cont.)

Figure 4 – Enclosure Testing Plan View (Test 5)

3.66 m by 3.66 m (12 ft. by 12 ft.),
3 sided enclosure with 2.4 m (8 ft.) high
ceiling and 0.2 m (8 in.) lintel at open wall
(top of Figure)

Tc Tree - 7 cm (3 in.) below,
30 cm (12 in.) below,
0.61 m (24 in.) below and
1.60 m (63 in.) above floor
5 Trees altogether as shown

Tc - 7 cm (3 in.) below ceiling and
1.6 m (63 in.) above floor
(2 thermocouples)

Tc - Embedded 6.4 mm (1/4 in.)
above ceiling panel, 7 cm (3 in.)
below ceiling above ignition and
positioned in Canola oil skillet
(3 thermocouples)
TEST DIAGRAMS (Cont.)

Figure 5 – Enclosure Testing Plan View (Tests 6 through 13)

3.66 m by 3.66 m (12 ft. by 12 ft.),
3 sided enclosure with 2.4 m (8 ft.) high
ceiling and 0.2 m (8 in.) lintel at open wall
(top of Figure)

Tc Tree - 7 cm (3 in.) below,
30 cm (12 in.) below,
0.61 m (24 in.) below and
1.60 m (63 in.) above floor
5 Trees altogether as shown

Tc - 7 cm (3 in.) below ceiling and
1.6 m (63 in.) above floor
(2 thermocouples)

Tc - Embedded 6.4 mm (1/4 in.)
above ceiling panel, 7 cm (3 in.)
below ceiling above ignition and
positioned in Canola oil skillet
(3 thermocouples)
3.66 m by 3.66 m (12 ft. by 12 ft.),
3 sided enclosure with 2.4 m (8 ft.) high
ceiling and 0.2 m (8 in.) lintel at open wall
(top of Figure)

Figure 6 – Enclosure Testing Plan View (Tests 14 through 15)
TEMPERATURE DATA FROM IGNITION TO NEAR TERMINATION OF SPRINKLER DISCHARGE FOR TESTS USING 3-SIDED ENCLOSURE (TESTS 5 THROUGH 15)
Figure 7 – Test 5 Sprinkler and Ignition Temperatures

70 / 30 Glycerin and Water - 6.9 bar (100 psig), K=3.1
Skillet 1.37m (4.5 ft.) from Sprinkler

- Sprinkler - 3 inch down
- Sprinkler - 5 ft. 3 in. off floor
- Embedded in Ceiling above ignition
- 3 in. down above ignition

Figure 8 – Test 5 SE Tree

70 / 30 Glycerin and Water - 6.9 bar (100 psig), K=3.1
Skillet 1.37m (4.5 ft.) from Sprinkler

- SE Tree - 3 in. down
- SE Tree - 12 in. down
- SE Tree - 24 in. down
- SE Tree - 5 ft. 3 in. off ground
Figure 9 – Test 5 SW Tree

Figure 10 – Test 5 W Center Tree
Figure 11 – Test 5 NW Tree

Figure 12 – Test 5 NE Tree
Figure 13 – Test 6 Sprinkler and Ignition Temperatures

70 / 30 Glycerin and Water - 6.9 bar (100 psig), K=3.1
Skillet 0.61m (2 ft.) from Sprinkler

Figure 14 – Test 6 SE Tree

70 / 30 Glycerin and Water - 6.9 bar (100 psig), K=3.1
Skillet 0.61m (2 ft.) from Sprinkler
70/30 Glycerin and Water - 6.9 bar (100 psig), K=3.1
Skillet 0.61m (2 ft.) from Sprinkler

Figure 15 – Test 6 SW Tree

70/30 Glycerin and Water - 6.9 bar (100 psig), K=3.1
Skillet 0.61m (2 ft.) from Sprinkler

Figure 16 – Test 6 W Center Tree
Figure 17 – Test 6 NW Tree

70 / 30 Glycerin and Water - 6.9 bar (100 psig), K=3.1
Skillet 0.61m (2 ft.) from Sprinkler

Figure 18 – Test 6 NE Tree

70 / 30 Glycerin and Water - 6.9 bar (100 psig), K=3.1
Skillet 0.61m (2 ft.) from Sprinkler
Figure 19 – Test 7 Sprinkler and Ignition Temperatures

50 / 50 Glycerin and Water - 6.9 bar (100 psig), K=3.1
0.098 m² (1 ft²) Heptane Pan; 0.61 m (2 ft.) from Sprinkler

Figure 20 – Test 7 SE Tree

50 / 50 Glycerin and Water - 6.9 bar (100 psig), K=3.1
0.098 m² (1 ft²) Heptane Pan; 0.61 m (2 ft.) from Sprinkler
50 / 50 Glycerin and Water - 6.9 bar (100 psig), K=3.1  
0.098 m² (1 ft²) Heptane Pan; 0.61 m (2 ft.) from Sprinkler

Figure 21 – Test 7 SW Tree

50 / 50 Glycerin and Water - 6.9 bar (100 psig), K=3.1  
0.098 m² (1 ft²) Heptane Pan; 0.61 m (2 ft.) from Sprinkler

Figure 22 – Test 7 W Center Tree
50 / 50 Glycerin and Water - 6.9 bar (100 psig), K=3.1
0.098 m$^2$ (1 ft$^2$) Heptane Pan; 0.61 m (2 ft.) from Sprinkler

Figure 23 – Test 7 NW Tree

Figure 24 – Test 7 NE Tree
Figure 25 – Test 8 Sprinkler and Ignition Temperatures

Figure 26 – Test 8 SE Tree
Figure 27 – Test 8 SW Tree

Figure 28 – Test 8 W Center Tree
Figure 29 – Test 8 NW Tree

Figure 30 – Test 8 NE Tree

50 / 50 Glycerin and Water - 6.9 bar (100 psig), K=3.1
Skillet 0.61m (2 ft.) from Sprinkler
Figure 31 – Test 9 Sprinkler and Ignition Temperatures

Water Only - 6.9 bar (100 psig), K=3.1
Skillet 0.61m (2 ft.) from Sprinkler

Figure 32 – Test 9 SE Tree

Water Only - 6.9 bar (100 psig), K=3.1
Skillet 0.61m (2 ft.) from Sprinkler
Figure 33 – Test 9 SW Tree

Water Only - 6.9 bar (100 psig), K=3.1
Skillet 0.61m (2 ft.) from Sprinkler

Figure 34 – Test 9 W Center Tree

Water Only - 6.9 bar (100 psig), K=3.1
Skillet 0.61m (2 ft.) from Sprinkler
Figure 35 – Test 9 NW Tree

Water Only - 6.9 bar (100 psig), K=3.1
Skillet 0.61m (2 ft.) from Sprinkler

Figure 36 – Test 9 NE Tree

Water Only - 6.9 bar (100 psig), K=3.1
Skillet 0.61m (2 ft.) from Sprinkler
Figure 37 – Test 10 Sprinkler and Ignition Temperatures

60 / 40 Propylene Glycol and Water - 6.9 bar (100 psig), K=3.1
Skillet 0.61m (2 ft.) from Sprinkler

Figure 38 – Test 10 SE Tree

60 / 40 Propylene Glycol and Water - 6.9 bar (100 psig), K=3.1
Skillet 0.61m (2 ft.) from Sprinkler
Figure 39 – Test 10 SW Tree

Figure 40 – Test 10 W Center Tree
60 / 40 Propylene Glycol and Water - 6.9 bar (100 psig), K=3.1
Skillet 0.61m (2 ft.) from Sprinkler

Temperature (°C)

Time (min)

Figure 41 – Test 10 NW Tree

60 / 40 Propylene Glycol and Water - 6.9 bar (100 psig), K=3.1
Skillet 0.61m (2 ft.) from Sprinkler

Temperature (°C)

Time (min)

Figure 42 – Test 10 NE Tree
Figure 43 – Test 11 Sprinkler and Ignition Temperatures

50 / 50 Glycerin and Water at 10.3 bar (150 psig) - K = 3.1
Skillet 0.61m (2 ft.) from Sprinkler

Figure 44 – Test 11 SE Tree

50 / 50 Glycerin and Water at 10.3 bar (150 psig) - K = 3.1
Skillet 0.61m (2 ft.) from Sprinkler
50 / 50 Glycerin and Water at 10.3 bar (150 psig) - K = 3.1
Skillet 0.61m (2 ft.) from Sprinkler

Figure 45 – Test 11 SW Tree

Figure 46 – Test 11 W Center Tree
Figure 47 – Test 11 NW Tree

Figure 48 – Test 11 NE Tree
Figure 49 – Test 12 Sprinkler and Ignition Temperatures

50 / 50 Glycerin and Water at 1.4 bar (20 psig) - K = 3.1
Skillet 0.61m (2 ft.) from Sprinkler

Figure 50 – Test 12 SE Tree

50 / 50 Glycerin and Water at 1.4 bar (20 psig) - K = 3.1
Skillet 0.61m (2 ft.) from Sprinkler
50 / 50 Glycerin and Water at 1.4 bar (20 psig) - K = 3.1
Skillet 0.61m (2 ft.) from Sprinkler

Figure 51 – Test 12 SW Tree

50 / 50 Glycerin and Water at 1.4 bar (20 psig) - K = 3.1
Skillet 0.61m (2 ft.) from Sprinkler

Figure 52 – Test 12 W Center Tree
50 / 50 Glycerin and Water at 1.4 bar (20 psig) - K = 3.1
Skillet 0.61m (2 ft.) from Sprinkler

**Figure 53 – Test 12 NW Tree**

**Figure 54 – Test 12 NE Tree**
Figure 55 – Test 13 Sprinkler and Ignition Temperatures

Water Only at 1.4 bar (20 psig) - K = 3.1
Skillet 0.61m (2 ft.) from Sprinkler

Figure 56 – Test 13 SE Tree

Water Only at 1.4 bar (20 psig) - K = 3.1
Skillet 0.61m (2 ft.) from Sprinkler
Water Only at 1.4 bar (20 psig) - K = 3.1
Skillet 0.61m (2 ft.) from Sprinkler

Figure 57 – Test 13 SW Tree

Figure 58 – Test 13 W Center Tree
Water Only at 1.4 bar (20 psig) - $K = 3.1$
Skillet 0.61m (2 ft.) from Sprinkler

Figure 59 – Test 13 NW Tree

Water Only at 1.4 bar (20 psig) - $K = 3.1$
Skillet 0.61m (2 ft.) from Sprinkler

Figure 60 – Test 13 NE Tree
Figure 61 – Test 14 Sprinkler and Ignition Temperatures

50 / 50 Glycerin and Water at 10.3 bar (150 psig) - K = 3.1
Skillet 0.46 m (1.5 ft.) from Sprinkler

Figure 62 – Test 14 SE Tree

50 / 50 Glycerin and Water at 10.3 bar (150 psig) - K = 3.1
Skillet 0.46 m (1.5 ft.) from Sprinkler
50/50 Glycerin and Water at 10.3 bar (150 psig) - K = 3.1
Skillet 0.46 m (1.5 ft.) from Sprinkler

Figure 63 – Test 14 SW Tree

Figure 64 – Test 14 W Center Tree

Temperature (°C) vs. Time (min) for the SW Tree and W Center Tree at various depths from the skillet.
50 / 50 Glycerin and Water at 10.3 bar (150 psig) - K = 3.1
Skillet 0.46 m (1.5 ft.) from Sprinkler

Figure 65 – Test 14 NW Tree

Figure 66 – Test 14 NE Tree
**Figure 67 – Test 15 Sprinkler and Ignition Temperatures**

Water Only at 10.3 bar (150 psig) - K = 3.1
Skillet 0.46 m (1.5 ft.) from Sprinkler

![Graph showing temperature vs. time for sprinkler and ignition temperatures](image)

**Figure 68 – Test 15 SE Tree**

Water Only at 10.3 bar (150 psig) - K = 3.1
Skillet 0.46 m (1.5 ft.) from Sprinkler

![Graph showing temperature vs. time for SE tree](image)
Figure 69 – Test 15 SW Tree

Water Only at 10.3 bar (150 psig) - K = 3.1
Skillet 0.46 m (1.5 ft.) from Sprinkler

Figure 70 – Test 15 W Center Tree

Water Only at 10.3 bar (150 psig) - K = 3.1
Skillet 0.46 m (1.5 ft.) from Sprinkler
Water Only at 10.3 bar (150 psig) - K = 3.1
Skillet 0.46 m (1.5 ft.) from Sprinkler

Figure 71 – Test 15 NW Tree

Figure 72 – Test 15 NE Tree
Item 10-8-16
1. Add a new section 7.6.1 as follows:

7.6.1 Dwelling Units. Antifreeze shall not be permitted to be used within the dwelling unit portions of sprinkler systems.

2. Renumber the remainder of the section accordingly.

Submitter’s Substantiation: As a result of information obtained through a report from the Fire Protection Research Foundation titled *Antifreeze Solutions in Home Fire Sprinkler Systems* and data compiled in a UL document titled *Fire Test Data Summary for Residential Sprinklers Discharging Antifreeze Mixtures* sufficient technical documentation now exists to highlight safety concerns and knowledge gaps regarding the provisions permitting antifreeze in sprinkler systems protecting dwelling units.

Until such time that appropriate research has been conducted to satisfy these concerns and knowledge gaps, the safe use of antifreeze solutions within sprinkler systems protecting dwelling units cannot be assured. Therefore NFPA13 should not be permitting the use of antifreeze systems within the standard.

Emergency Nature:
1. The proposed TIA intends to correct a previously unknown existing hazard.
2. The proposed TIA intends to offer to the public a benefit that would lessen a recognized (known) hazard or ameliorate a continuing dangerous condition or situation.

Attachments:
- Fire Protection Research Foundation titled *Antifreeze Solutions in Home Fire Sprinkler Systems* dated May 28, 2010
- UL document titled *Fire Test Data Summary for Residential Sprinklers Discharging Antifreeze Mixtures* dated May 26, 2010
Agenda Item: TIA 13-2010
Document: NFPA 13, Standard for the Installation of Sprinkler Systems
Reference: 7.6.1
(TIA Log 1000)

Comment Closing: 7/23/2010
0 Public Comments Received

TIA TCC BALLOT RESULTS PENDING

According to 5.4 in the NFPA (RGCP), the final results show this TIA HAS/HAS NOT achieved the necessary votes on both Question 1 (Correlation Issues) and Question 2 (Emergency Nature).

The number of affirmative votes needed to obtain a recommendation to issue the TIA is ___.

[___ (eligible to vote) – ___ (not returned) – ___ (abstentions) = ___ x 0.75 = ___]

In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required.

[___ eligible ÷ 2 = ___ + 1 = ___ (this is the simple majority)]

0 Eligible to Vote
0 Not Returned

TCC PENDING Ballot results for Correlation Issues are as follows:
0 Affirmative
0 Negative
0 Abstentions

Final Action: PASS/FAIL

TCC PENDING Ballot results for Emergency Nature are as follows:
0 Affirmative
0 Disagreement
0 Abstentions

Final Action: PASS/FAIL

TIA PRELIMINARY AUT-SSI TC BALLOT RESULTS (Final TC Ballot Due 7/14/10)
(Ballot results may change due to public comment circulation, if any)

According to 5.4 in the NFPA (RGCP), the final results show this TIA IS NOT achieving the necessary votes on both Question 1 (Technical Merit) and IS on Question 2 (Emergency Nature).

The number of affirmative votes needed to obtain a recommendation to issue the TIA is 15.

[30 (eligible to vote) – 10 (not returned) – 1 (abstention) = 19 x 0.75 = 14.25]

In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required.

[30 eligible ÷ 2 = 15 + 1 = 16 (this is the simple majority)]

30 Eligible to Vote
10 Not Returned (Bahadori, Baker, Brock, Linder, Marburger, McPhee, Mowrer, Patel, Slocum, Studer)

TC PRELIMINARY Ballot results for Technical Merit are as follows:
12 Affirmative (Laverick w/comment)
7 Negative (Dornbos, Duke, Keeping, Miller, Schwab, Swantek, Underwood)
1 Abstention (Smith)

Final Action: FAILING

TC Preliminary Results continued on next page
TC PRELIMINARY Ballot results for Emergency Nature are as follows:
16   Affirmative (Keeping w/comment)
  3   Disagreement (Dornbos, Miller, Underwood)
  1   Abstention (Smith)

Final Action: PASSING
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 1000
Add Section 7.6.1 Proposed 2010 Editions of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: I agree with the TECHNICAL MERITS of the Proposed TIA to add section 7.6.1.

_______ AGREE  X  DISAGREE*  _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

The need to curtail use of ALL antifreeze solutions within dwelling unit portions of sprinkler systems is not supported by the limited testing described in reports accompanying the TIA. The Executive Summary included in the support documents states that large-scale ignition of the antifreeze solutions did not occur in any tests using a 50% solution. Consequently, I believe measures proposed in TIA 998 are a sufficient and more appropriate response to safety concerns and knowledge gaps recently acknowledged.

Question 2: I agree that the subject is of an EMERGENCY NATURE.

_______ AGREE  X  DISAGREE*  _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

See Explanation of Vote

Signature

Del Dornbos
Name (Please Print)

July 8, 2010
Date

Please return the ballot on or before Friday, July 9, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110  E-mail: jmoreaucorreia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 1000
Add Section 7.6.1 Proposed 2010 Editions of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: I agree with the TECHNICAL MERITS of the Proposed TIA to add section 7.6.1.

_______ AGREE   ______ DISAGREE*   ______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

PROHIBITING ALL USE OF ANTIFREEZE IS IMPOSSIBLE.

_____________________________________________________

Question 2: I agree that the subject is of an EMERGENCY NATURE.

_______ AGREE   ______ DISAGREE*   ______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

_____________________________________________________

______________________________
Signature

ROBERT E. DUKE

Name (Please Print)

7/9/10

Date

Please return the ballot on or before Friday, July 9, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110

E-mail: jmoreau.correia@nfpa.org

Standards Council Supplemental Agenda August 3-5, 2010
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 1000
Add Section 7.6.1 Proposed 2010 Editions of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: I agree with the TECHNICAL MERITS of the Proposed TIA to add section 7.6.1.

_____ AGREE        ☑ DISAGREE*        _____ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

SEE ATTACHED SHEET

Question 2: I agree that the subject is of an EMERGENCY NATURE.

☑ AGREE        _____ DISAGREE*        _____ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

SEE ATTACHED SHEET

Signature
LARRY KEEPING

Name (Please Print)

Date
7 July 2010

Please return the ballot on or before Friday, July 9, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110
E-mail: jmoreaucorreia@nfpa.org
NFPA 13
Ballot for TC on Sprinkler System Installation Criteria
Proposed Tentative Interim Amendment Log No. 1000

Regarding this issue, I Disagree with the Technical Merits of the proposed TIA 1000.

Comment on Disagreement:

Based on my reading of the information package that came as part of the Ballot materials, it appears that 50% / 50% antifreeze solutions perform almost as well as water does, so I believe that this mixture will give us a viable mechanism to sprinkler dwelling units in freezing environments without undue risk. Therefore the control of the A/F solution proposed by the corresponding TIA 998 seems a more reasonable approach. A total prohibition of antifreeze within dwelling units should not be necessary.

I would also note that in the testing there were instances (ie. tests no. 1, 3 & 5) when higher concentrations of A/F were able to control the fire roughly the same as water, so A/F solution isn’t necessarily the only culprit in the fire scenarios. It is a well known fact that just throwing water on a kitchen oil fire can cause a flash fire, so all of the variables (ie. pressures, k-factors, drop sizes, distances, etc.) that are involved need to be studied, so that we can better understand the mechanisms, before a complete prohibition should be considered. At this point it is not even clear if this is a kitchen / cooking oil problem or if it is also applicable to Class A type fires.

Further, I do not support the proposal to ban A/F from dwelling units, because there are scenarios where water based wet systems aren’t practical due to the freezing concerns and dry systems aren’t practical due to the 15 second water delivery time criteria, so the only available option would be to use an A/F type system.

Regarding this Issue, I Agree that this issue is of an Emergency Nature.

Comment on Agreement:

The reported fire incidents and the recent UL testing certainly points to a dire potential hazard with A/F systems with higher concentrations, and we cannot in good conscience maintain the status quo. However, as noted above, I support the proposed TIA 998, in lieu of imposing a complete ban on A/F solutions within dwelling units.

Larry Keeping, P.Eng
Vipond Fire Protection
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 1000
Add Section 7.6.1 Proposed 2010 Editions of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: I agree with the TECHNICAL MERITS of the Proposed TIA to add section 7.6.1.

AGREE   DISAGREE*   ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

See the action on TIA Log 998 and the comments attached to that log.

Question 2: I agree that the subject is of an EMERGENCY NATURE.

AGREE   DISAGREE*   ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

As noted in the NFPA Research Foundation report, additional work is needed to complete action. See also the action on TIA Log 998.

Signature
Thomue H. Miller, PE
Name (Please Print)
July 9, 2010
Date

Please return the ballot on or before Friday, July 9, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110
E-mail: jmoreaucorreia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 1000
Add Section 7.6.1 Proposed 2010 Editions of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: I agree with the TECHNICAL MERITS of the Proposed TIA to add section 7.6.1.

☐ AGREE ☑ DISAGREE* ☐ ABSTAIN* ✓

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

DATA INDICATES ISSUES WITH 70/30 MIX USING SMALL ORIFICES AND HIGH Pressures. BANING ALL ANTIFREEZE BASED ON A NARROW RANGE OF TEST PARAMETERS IS AN OVERREACTION. I FEEL TIA # 997 IS MORE APPROPRIATE.

Question 2: I agree that the subject is of an EMERGENCY NATURE.

☑ AGREE ☐ DISAGREE* ☐ ABSTAIN* ✓

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

________________________________________
Signature

Peter J. Schwab

Name (Please Print)

7/6/10

Date

Please return the ballot on or before Friday, July 9, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110 E-mail: jmoreaucorreia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 1000
Add Section 7.6.1 Proposed 2010 Editions of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: I agree with the TECHNICAL MERITS of the Proposed TIA to add section 7.6.1.

```
AGREE  x  DISAGREE*  ABSTAIN*
```

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.
The data presented thus far (UL Report of May 26, 2010) indicates safe operating conditions
exist at 50% antifreeze concentrations. Accordingly, setting a temporary concentration limit
at 50% (Ref. TIA998) appears to be the most prudent short term action. Implementing a complete
ban seems excessive and potentially burdensome for building owners and contractors for the
remediation of existing systems that may pose no immediate hazard. A complete ban may render
some dwellings unprotected, during the process of bracketing and validating the actual risk.

Question 2: I agree that the subject is of an EMERGENCY NATURE.

```
x  AGREE  DISAGREE*  ABSTAIN*
```

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

__________________________________________________________

Signature

Leonard R. Swantek

Name (Please Print)
July 8, 2010

Date

Please return the ballot on or before Friday, July 9, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110  E-mail: jmoreaucorreia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 1000
Add Section 7.6.1 Proposed 2010 Editions of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: I agree with the TECHNICAL MERITS of the Proposed TIA to add section 7.6.1.

_____ AGREE  _____ DISAGREE*  _____ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

NEEDS TO INCLUDE "WHEN RESIDENTIAL SPRINKLERS ARE USED."

NO TESTING HAS BEEN DONE WITH OTHER SPRINKLERS


Question 2: I agree that the subject is of an EMERGENCY NATURE.

_____ AGREE  _____ DISAGREE*  _____ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

THIS IS REACTING TOO QUICKLY IN light of INCOMPLETE TEST DATA.


Signature

Lydia K Underwood

Name (Please Print)

7/6/10

Date

Please return the ballot on or before Friday, July 9, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110  E-mail: jmoreaucorrela@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 1000
Add Section 7.6.1 Proposed 2010 Editions of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: I agree with the TECHNICAL MERITS of the Proposed TIA to add section 7.6.1.

X  Agree          Disagree*       Abstain*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a disagreement or abstaining position.

We prefer TIA 1000 over TIA 998.

Question 2: I agree that the subject is of an EMERGENCY NATURE.

X  Agree          Disagree*       Abstain*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a disagreement or abstaining position.

George E. Laverick
Signature

George E. Laverick
Name (Please Print)
July 3, 2010
Date

Please return the ballot on or before Friday, July 9, 2010.
Pleased RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169 FAX: (617) 984-7110 E-mail: jmoreaucorreia@nfpa.org

TIA 1000
Laverick
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 1000
Add Section 7.6.1 Proposed 2010 Editions of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: I agree with the TECHNICAL MERITS of the Proposed TIA to add section 7.6.1.

_________ AGREE    ___________ DISAGREE*  _______ X _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.
Further research is being conducted to investigate antifreeze solutions in home fire
sprinkler systems. Because research on this topic is ongoing, the Standards Council
should decide on the TIA based on the most recent research available at that time.

Question 2: I agree that the subject is of an EMERGENCY NATURE.

_________ AGREE    ___________ DISAGREE*  _______ X _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.
Further research is being conducted to investigate antifreeze solutions in home fire
sprinkler systems. Because research on this topic is ongoing, the Standards Council
should decide on the TIA based on the most recent research available at that time.

[Signature]

For MIKE KIRN

[Name (Please Print)]

[Date]

7-9-2010

Please return the ballot on or before Friday, July 9, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169  FAX: (617) 984-7110  E-mail: jmoreaucorreia@nfpa.org
Agenda Item: TIA 13-2010
Document: NFPA 13, Standard for the Installation of Sprinkler Systems
Reference: 7.6.1
(TIA Log 1000)

Comment Closing: 7/23/2010
3 Public Comment Received

TIA TCC FINAL BALLOT RESULTS (as of 7/26/10)
(Ballot results may change due to public comment circulation)

According to 5.4 in the NFPA (RGCP), the final results show this TIA **HAS NOT** achieved the necessary votes on Question 1 (Correlation Issues) and **HAS** on Question 2 (Emergency Nature).

The number of affirmative votes needed to obtain a recommendation to issue the TIA is **13**.

\[
20 \text{ (eligible to vote) } - 4 \text{ (not returned) } - 1 \text{ (abstention) } = 17 \times 0.75 = 12.75
\]

In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required.

\[
20 \text{ eligible } ÷ 2 = 10 + 1 = 11 \text{ (this is the simple majority)}
\]

<table>
<thead>
<tr>
<th>20</th>
<th>Eligible to Vote</th>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>Not Returned (Schirmer, Stultz)</td>
</tr>
</tbody>
</table>

TCC FINAL Ballot results for **Correlation Issues** are as follows:
8  Affirmative (Bell, Hilton w/comment)
9  Negative (Fleming, Franson, Friedman, Fuller, Grill, Hoffman, Leavitt, O Neill, Sheppard)
1  Abstention (Underwood)

**Final Action: FAIL**

TCC FINAL Ballot results for **Emergency Nature** are as follows:
16  Affirmative (Bell, Fleming w/comment)
1  Disagreement (Friedman)
1  Abstention (Underwood)

**Final Action: PASS**

TIA FINAL AUT-SSI TC BALLOT RESULTS
(Ballot results may change due to public comment circulation)

According to 5.4 in the NFPA (RGCP), the final results show this TIA **HAS NOT** achieved the necessary votes on both Question 1 (Technical Merit) and **HAS** on Question 2 (Emergency Nature).

The number of affirmative votes needed to obtain a recommendation to issue the TIA is **17**.

\[
30 \text{ (eligible to vote) } - 7 \text{ (not returned) } - 1 \text{ (abstention) } = 22 \times 0.75 = 16.5
\]

In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required.

\[
30 \text{ eligible } ÷ 2 = 15 + 1 = 16 \text{ (this is the simple majority)}
\]

<table>
<thead>
<tr>
<th>30</th>
<th>Eligible to Vote</th>
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</thead>
<tbody>
<tr>
<td>7</td>
<td>Not Returned (Brock, Marburger, McPhee, Mowrer, Patel, Slocum, Studer)</td>
</tr>
</tbody>
</table>

TC FINAL Ballot results for **Technical Merit** are as follows:
12  Affirmative (Laverick w/comment)
10  Negative (Bilbo, Dornbos, Duke, Keeping, Linder, Miller, Schwab, Swantek, Underwood, Victor)
1  Abstention (Smith)

**Final Action: FAIL**

TC Final Results continued on next page
Ballot results for Emergency Nature are as follows:

- 19 Affirmative (Keeping w/comment)
- 3 Disagreement (Dornbos, Miller, Underwood)
- 1 Abstention (Smith)

Final Action: PASS
From: Russ Fleming [fleming@nfpa.org]  
Sent: Thursday, July 15, 2010 4:11 PM  
To: Goyette, Joanne  
Cc: 'Isman Kenneth'  
Subject: RE: NFPA 13 Proposed TIA 1000 - Due Monday, July 19, 2010

Joanne:

My ballot is as follows on this proposed TIA:

✓ Correlation – Disagree. The total ban on antifreeze systems in dwelling units in NFPA 13 would cause a correlation problem within NFPA 13 where antifreeze would still be permitted in occupancies such as hospitals that are not considered dwelling units. It should also be noted that one of the three reported incidents of antifreeze ignition took place in a restaurant seating area, which would not be addressed by the TIA but is within the scope of NFPA 13, adding to the internal correlation problem. Furthermore, the total ban on antifreeze would affect all existing and potential antifreeze solutions, including non-combustible solutions. We should be encouraging the development of noncombustible and low combustibility alternatives, but this TIA would remove the incentive.

✓ Emergency Nature – Agree (some action on antifreeze needs to be taken).

✓ Russ Fleming

---

From: Goyette, Joanne [mailto:jgoyette@NFPA.org]  
Sent: Thursday, July 15, 2010 10:50 AM  
To: Moreau-Correla, Jeanne  
Cc: Goyette, Joanne  
Subject: FW: NFPA 13 Proposed TIA 1000 - Due Monday, July 19, 2010

TO: The Technical Correlating Committee on Automatic Sprinkler Systems

Dear Committee Members:

Attached is the Ballot Package for NFPA 13 Proposed TIA 1000. The due date for return of the ballot is Monday, July 19, 2010. Please fax your ballots to 617-984-7110 or email to jmoreaucorrela@nfpa.org

The ballot and supporting material has also been posted to the AUT-AAC Ecommittee web page under Ballot Information, TIA Ballots. Please note the TC Initial Ballot Package, Circulation, and Final Results have also been posted to your web page.

PLEASE NOTE: Click on the Heading “Ballot Information” first in order to view materials contained in the folder on the Ecommittee page.

Note: The return of ballots and attendance at Committee Meetings are required in accordance with the Regulations governing Committee Projects.

Thank you,
Supplemental Attachment 10-8-16-b

TECHNICAL CORRELATING COMMITTEE
LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 1000
Add new section 7.6.1 and renumber accordingly to the 2010 Editions of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA Regs.

AGREE  DISAGREE*  ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant section(s)/paragraph(s) of the correlation issue and describe.

This TIA does not correlate with TIA 998 which recently achieved the 3/4 majority vote and requires the use of factory premixed AF and limits the concentration of AF to 50% within dwelling unit areas of NFPA 13.

Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

AGREE  DISAGREE*  ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.

Signature: Scott Freason

Name (Please Print): Scott Freason
Date: July 16, 2010

Please return the ballot on or before Monday, July 19, 2010

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110  E-mail: jmoreau@nfpa.org
Proposed TIA 1000

✓ Question 1 Disagree - Per Article 3.4.2 the TCC is resolving a conflict between those who propose language change for limiting concentration of pre-mixed antifreeze and those who want deletion of the antifreeze. "The TCC shall be responsible for resolving conflicts, achieving correlation among the recommendations of the TCs, ...."

✓ Question 2 Disagree – previously submitted Logs 996, 997 and 998 set the path forward while added testing is conducted.

From: Goyette, Joanne [mailto:jgoyette@NFPA.org]
Sent: Thursday, July 15, 2010 10:50 AM
To: Moreau-Correia, Jeanne
Cc: Goyette, Joanne
Subject: FW: NFPA 13 Proposed TIA 1000 - Due Monday, July 19, 2010

TO: The Technical Correlating Committee on Automatic Sprinkler Systems

Dear Committee Members:

Attached is the Ballot Package for NFPA 13 Proposed TIA 1000. The due date for return of the ballot is Monday, July 19, 2010. Please fax your ballots to 617-984-7110 or email to jmoreaucorreia@nfpa.org

The ballot and supporting material has also been posted to the AUT-AAC Ecommittee web page under Ballot Information, TIA Ballots. Please note the TC Initial Ballot Package, Circulation, and Final Results have also been posted to your web page.

PLEASE NOTE: Click on the Heading “Ballot Information” first in order to view materials contained in the folder on the Ecommittee page.

Note: The return of ballots and attendance at Committee Meetings are required in accordance with the Regulations governing Committee Projects.

Thank you,

Jeanne Moreau
Technical Projects Supervisor
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
Ph: 617-984-7586
Fx: 617-984-7110
Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA Regs.

X DISAGREE*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant section(s)/paragraph(s) of the correlation issue and describe.

There is a correlation issue between this TIA and TIA's 998, 997, and 996.

Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

X AGREE

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a negative/disagreement or abstaining position.

Signature
David B. Fuller
Name (Please Print)
July 23, 2010
Date

Please return the ballot on or before Monday, July 19, 2010

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110
E-mail: jmoreaucorrela@nfpa.org
TECHNICAL CORRELATING COMMITTEE
LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 1000
Add new section 7.6.1 and renumber accordingly to the 2010 Editions of NFPA 13,
Standard for the Installation of Sprinkler Systems

**Question 1:** I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA Regs.

- [ ] AGREE
- [x] DISAGREE*
- [ ] ABSTAIN*

**EXPLANATION OF VOTE** - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant section(s)/paragraph(s) of the correlation issue and describe.

---

This TIA is in conflict with TIA 998 to NFPA 13.

---

**Question 2:** I agree that the subject of this TIA is of an **EMERGENCY NATURE**.

- [x] AGREE
- [ ] DISAGREE*
- [ ] ABSTAIN*

**EXPLANATION OF VOTE** - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.

---

**Signature**
Raymond A. Grill
Name (Please Print)
7/17/2010
Date

Please return the ballot on or before **Monday, July 19, 2010**

**PLEASE RETURN TO:**
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

**FAX:** (617) 984-7110 **E-mail:** jmoreaucorreia@nfpa.org
Moreau-Correia, Jeanne

From: Aleksandar Hoffman [AHoffman@vikingfire.ca]
Sent: Thursday, July 22, 2010 1:00 PM
To: Moreau-Correia, Jeanne
Subject: RE: Circulation of Votes - NFPA 13 TIA 1000 - Due Friday, July 23, 2010
Attachments: image001.jpg; image002.jpg; image003.jpg; image004.jpg; image005.jpg

Hello Jeanne,

I would like to change my votes on ballot 1000 as follows:

Correlation Issue - Disagree

Explanation:

Proposed TIA 1000 is in conflict with TIA 998, which has been endorsed by TCC and has achieved required majority vote by the NFPA 13 Technical Committee (AUT-SSI).

Please let me know if you need anything else from me regarding this vote.

Regards,

Alex Hoffman, P.Eng., Regional Manager
Viking Fire Protection Inc.
7885 North Fraser Way, Unit 140, Burnaby, BC, V5J 5M7
Tel: 604-324-7122
Fax: 604-324-8280

From: Moreau-Correia, Jeanne [mailto:jmoreau@NFPA.org]
Sent: Tuesday, July 20, 2010 1:04 PM
To: Walker, Nancy; Moreau-Correia, Jeanne
Subject: Circulation of Votes - NFPA 13 TIA 1000 - Due Friday, July 23, 2010

TO: The Technical Correlating Committee on Automatic Sprinkler Systems

Dear Committee Members:

Attached is the Circulation of Votes for the NFPA 13 Proposed TIA 1000 Ballot. If you wish to change your vote, changes are due back at NFPA by Friday, July 23, 2010. If you haven’t yet returned a ballot, you may return your vote during the circulation period.

Please return your ballot by fax to 617-984-7110 or e-mail jmoreaucorreia@nfpa.org

Please remember that the return of ballots and attendance at Committee Meetings are required in accordance with the Regulations Governing Committee Projects.

Thank you,

Jeanne Moreau
Technical Projects Supervisor
National Fire Protection Association
TECHNICAL CORRELATING COMMITTEE
LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 1000
Add new section 7.6.1 and renumber accordingly to the 2010 Editions of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA Regs.

[ ] AGREE [x] DISAGREE* [ ] ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant section(s)/paragraph(s) of the correlation issue and describe.

SEE ATTACHED

[ ]

Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

[ ] AGREE [x] DISAGREE* [ ] ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.

[ ]

[Signature]

[Name (Please Print)]

[Date]

Please return the ballot on or before Monday, July 19, 2010

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110
E-mail: jmoreauxcorreia@nfpa.org
Comment for Negative (DISAGREE) Vote
Question 1: TIA Logs 994, 995, 996, 997, 998, and 1000

These proposals are related and cannot be incorporated independent of each other. Regardless of the final action on each, the requirement(s) regarding the use of antifreeze for residential occupancies must be correlated between NFPA 13, 13R, and 13D. At this time it appears that log 998 is the only proposal of the 6 related to this issue that has received the required votes to pass ballot for both technical merit and emergency nature. Log 998 for NFPA 13 cannot be instituted without a consensus on the issue between the three installation standards. In addition, we must not forget that the maintenance requirements found in NFPA 25 related to antifreeze systems must be addressed if any changes to 13 and 13R are approved.
TECHNICAL CORRELATING COMMITTEE
LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 1000
Add new section 7.6.1 and renumber accordingly to the 2010 Editions of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA Regs.

[ ] AGREE [x] DISAGREE* [ ] ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant section(s)/paragraph(s) of the correlation issue and describe.

Does not correlate with TIA 998 which achieved 3A majority vote.

Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

[ ] AGREE [x] DISAGREE* [ ] ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.

______________________________

Signature: John O'Neill

Name (Please Print) 7-22-10

Date

Please return the ballot on or before Monday, July 19, 2010

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110
E-mail: jmoreaucorreia@nfpa.org
Moreau-Correia, Jeanne

From: Bill Sheppard [w_sheppard@yahoo.com]
Sent: Friday, July 16, 2010 7:47 AM
To: Moreau-Correia, Jeanne
Subject: Re: NFPA 13 Proposed TIA 1000 - Due Monday, July 19, 2010

Jeanne, with respect to NFPA 13 Proposed TIA 1000:

✓ 1-Disagree. The previously submitted TIAs 994 and 995 called for the elimination of the antifreeze solution, and in keeping with my ballot comments, I have stated that it is acceptable to use the 50% antifreeze solution limit until further research is complete. This same approach applies for TIA 1000.

✓ 2-Agree.

thanks,

✓ Bill Sheppard
TECHNICAL CORRELATING COMMITTEE
LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 1000
Add new section 7.6.1 and renumber accordingly to the 2010 Editions of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA Regs.

[ ] AGREE [ ] DISAGREE* [X] ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant section(s)/paragraph(s) of the correlation issue and describe.

THIS PROPOSED TIA FAILED TO PASS IN COMMITTEE: BALOTTING

THE TOP IS A MOOT POINT.

Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

[ ] AGREE [ ] DISAGREE* [X] ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.

SEE ABOVE

__________________________
Signature
LYNN K. LINDSLEY
Name (Please Print)
7/1/10
Date

Please return the ballot on or before Monday, July 19, 2010

PLEASE RETURN TO:
Jeanie Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110

E-mail: jmoreaucorreia@nfpa.org
TECHNICAL CORRELATING COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 1000

Add new section 7.6.1 and renumber accordingly to the 2010 Edition of NFPA 13,
Standard for the Installation of Sprinkler Systems

**Question 1:** I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA Regs.

✓ X AGREE ☐ DISAGREE* ☐ ABSTAIN*

**EXPLANATION OF VOTE** - Please type or print your comments:
*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant section(s)/paragraph(s) of the correlation issue and describe.

From a correlation standpoint, we believe the restrictions regarding the use of antifreeze in dwelling units should be the same for NFPA 13D, NFPA 13R and 13 based upon information currently available.

**Question 2:** I agree that the subject of this TIA is of an **EMERGENCY NATURE**.

✓ X AGREE ☐ DISAGREE* ☐ ABSTAIN*

**EXPLANATION OF VOTE** - Please type or print your comments:
*An explanation must accompany a negative/disagreement or abstaining position.

Immediate action needs to be taken to eliminate reference to antifreeze concentrations that have demonstrated the potential to ignite and create a large-scale spray type fire.

__Kerry M. Bell__
Signature

✓ __Kerry M. Bell__ Name (Please Print)

___ 7/14/10 ___ Date

Please return the ballot on or before **Friday, July 16, 2010**

**PLEASE RETURN TO:**
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169  FAX: (617) 984-7110  E-mail: jmoreaucorreia@nfpa.org
TECHNICAL CORRELATING COMMITTEE
LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 1000
Add new section 7.6.1 and renumber accordingly to the 2010 Editions of NFPA 13,
Standard for the Installation of Sprinkler Systems

Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA Regs.

✓ AGREE    DISAGREE*    ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant section(s)/paragraph(s) of the correlation issue and describe.

THERE IS NO CORRELATION ISSUE BECAUSE THIS WENT DOWN ON TECHNICAL MERIT WHEN IT WAS BALLOTED IN THE SSI TC.

✓ Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

✓ AGREE    DISAGREE*    ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.

Luiz Hulkr
Signature

Name (Please Print)  7/16/2010

Date

Please return the ballot on or before Monday, July 19, 2010

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110     E-mail: jmoreaucorreia@nfpa.org
Dear NFPA Team,

My comments are given hereunder

1. David Hague’s ’TIA Log No 1000 for 7.6.1. Dwelling units’ is acceptable; my additional comments are ’keep dry pipe sprinklers for dwelling units till such time alternative safe antifreeze solutions are ready in hand’.

2. For Ken Isman’s TIA 997 & 998, NOT agreeable to the use of ANTIFREEZE; a dry sprinkler with air / nitrogen filled one is welcome.

Best regards
srinivas sridhar CEng CEnv MBA
HSO
FERTIL
ABUDHABI
UAE.
s.srinivas@fertil.com

Date: Wed, 30 Jun 2010 14:10:14 +0000
From: nfpa@e.nfpa.org
To: srinivasan_sridh@hotmail.com
Subject: Revised July 2010 NFPA News

nfpa NEWS
Providing NFPA Members up-to-date information on NFPA codes and standard activities

Read the Revised July 2010 issue of  NFPA News

In this issue:

- Comments Sought for Proposed TIAs to NFPA 13, NFPA 13D and NFPA 13R. Three additional TIA’s have been added since last July notification.
July 20, 2010

Secretary
Standards Council
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471

RE: TIA 994, TIA 995, TIA 996, TIA 997, TIA 998, and TIA 1000

Dear Sir:

On July 13, 2010, the Utah Fire Prevention Board met in a regularly scheduled Board meeting to address a number of fire prevention concerns in the State of Utah. One of those items of discussion was the Safety Alert issued by the National Fire Protection Association (NFPA) with regard to the use of antifreeze in automatic fire sprinkler systems in a residential setting.

The Utah Fire Prevention Board is the overseeing authority for fire prevention in the State of Utah. The Board members are appointed by the Governor of the State of Utah and consists of ten members from various disciplines. The Board has statutory authority over the Office of the State Fire Marshal, oversight of the fire code which is adopted statewide by the Utah State Legislature, firefighter training, certification and licensing of several different fire oriented disciplines, fireworks, fire incident reporting, etc. The Utah Fire Prevention Board has been in existence with that statutory authority since it's inception in 1964.

The Board’s discussion and comments received were in response to the Safety Alert issued by NFPA that directed that all residential fire sprinkler systems that use antifreeze, have the antifreeze drained and refilled with water. The Board also discussed the several proposed TIAs that would affect the continued use of antifreeze in the State of Utah in residences. The Board also discussed the study conducted by The Fire Protection Research Foundation on the use of antifreeze in a residential setting, and the many places throughout that document requesting that further research or further study needs to be completed to bring this concern to a complete understanding.

The Board felt that this is a very complex and diverse concern for there are large numbers of these types of systems in the State of Utah alone. The Board wanted to convey to those at the National Fire Protection Association that the initial interim direction by NFPA to drain the antifreeze out and refill with water simply will not work in the State of Utah. There would be hundreds of thousands of dollars of water damage from broken pipes that would freeze in the first winter season. In the higher elevations in the State of Utah, winter begins in approximately eight weeks. In the coldest portion of winter, all of the State of Utah will be subject to freezing winter temperatures, and some areas will be near or below 0 degrees Fahrenheit and stay there for an extended period of time. With current designs and piping layout, it is impossible to insulate and expect the systems to not freeze and break.

The Utah Fire Prevention Board strongly urges NFPA that before there are directions given from the largest fire prevention organization in the world, that all the technical data needs to be collected and fully analyzed for validity. The Board understands that there could be a problem with the usage of antifreeze in a residential setting that will need some correction. The Board feels though, that the direction given from NFPA to drain the antifreeze and refill with water will cause a much greater problem than leaving the antifreeze in it's current form.
The Board asks that the current Technical Interim Amendments, TIA 994, 995, 996, 997, 998, and 1000 either be denied or placed on hold till all data can be fully studied. Just draining out the antifreeze and replacing it with water creates a far bigger problem than it corrects. Direction from NFPA for occupants in residences using antifreeze to immediately leave the residence in the event of fire, has a much more practical and attainable application than just draining the system.

Antifreeze systems have been in use in this country since the 1940s, and their usage is now so interwoven throughout our fire protection systems, that temporary and costly interim direction from NFPA will due more long term damage than leaving the systems intact as they currently exist until all research has been completed and analyzed. The perception of the citizens we serve is paramount to the success of any effort in preventing loss of life and property from the ravages of fire. Hasty response or incomplete solutions will quickly erode the confidence of our citizens that has taken years for the fire service to attain in the State of Utah.

The full interest of the Utah Fire Prevention Board is the betterment of the citizens of the State of Utah with regard to fire and life safety. We as the Fire Prevention Board for the State of Utah, respectfully submit this to you as Secretary of the Standards Council for their review.

Sincerely,

Ted Black, Chairman
Utah Fire Prevention Board

cc: Fire Prevention Board members

Ron L. Morris
State Fire Marshal

Utah State Fire Chiefs Association

Fire Marshal’s Association of Utah

Raymond B. Bizal
NFPA

Lana Taylor
Assistant Attorney General
July 23, 2010

Secretary, Standards Council
NFPA
1 Batterymarch Park
Quincy, MA
02169-7471

To Whom it May Concern,

Please accept the following comment regarding TIA 1000.

The Tahoe Douglas Fire Protection District opposes the changes proposed in TIA 1000. Sprinklers have a proven track record of saving lives. The changes proposed in TIA 1000 are not feasible in most existing sprinkler systems within the Tahoe Douglas Fire District. The changes in TIA 1000, if implemented would result in many properties going without, or with partial fire protection. The Tahoe Douglas Fire Protection District serves an area in which below freezing temperatures can be expected nine months per year. Antifreeze is the only freeze protection option for the majority of these occupancies.

Further testing must be conducted before the drastic measures found in TIA 1000 are implemented.

Please do not hesitate to call if you have any questions.

Sincerely

Mark Novak
Fire Marshal
1. Revise Section 4.1.4 as follows:

4.1.4 Antifreeze Systems. Antifreeze solutions with concentrations in excess of 50% by volume shall not be permitted.

4.1.4.1 Only factory premixed solutions shall be permitted.

2. Renumber current 4.1.4 as 4.1.4.2

3. Revise Section 8.3.3 as follows:

8.3.3 Antifreeze Systems.

8.3.3.1 Antifreeze Solutions. Antifreeze solutions with concentrations in excess of 50% by volume shall not be permitted.

8.3.3.1.1 Only factory premixed solutions shall be permitted.

4. Renumber remainder of section accordingly.

5. Revise Table 8.3.3.2.3 as follows:

<table>
<thead>
<tr>
<th>Material</th>
<th>Solution (by volume)</th>
<th>Specific Gravity at 60°F (15.6°C)</th>
<th>Freezing Point °F °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glycerine</td>
<td>50% water</td>
<td>1.145</td>
<td>-20.9 -29.4</td>
</tr>
<tr>
<td></td>
<td>40% water</td>
<td>1.174</td>
<td>-47.8 -44.4</td>
</tr>
<tr>
<td></td>
<td>30% water</td>
<td>1.187</td>
<td>-49.2 -40.0</td>
</tr>
<tr>
<td>Hydrometer scale 1.000 to 1.200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propylene glycol</td>
<td>60% water</td>
<td>1.054</td>
<td>-6 -21.1</td>
</tr>
<tr>
<td></td>
<td>50% water</td>
<td>1.041</td>
<td>-26 -32.2</td>
</tr>
<tr>
<td></td>
<td>40% water</td>
<td>1.045</td>
<td>-60 -51.1</td>
</tr>
<tr>
<td>Hydrometer scale 1.000 to 1.200 (subdivisions 0.002)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Submitter’s Substantiation. As a result of information obtained through a report from the Fire Protection Research Foundation titled Antifreeze Solutions in Home Fire Sprinkler Systems and data compiled in a UL document titled Fire Test Data Summary for Residential Sprinklers Discharging Antifreeze Mixtures sufficient technical documentation now exists to highlight safety concerns and knowledge gaps regarding the provisions permitting antifreeze in sprinkler systems protecting dwelling units.

Until such time that additional research is conducted to satisfy the concerns and knowledge gaps the safe use of antifreeze solutions in high concentrations within sprinkler systems protecting dwelling units cannot be assured.
Mandating the use of factory premix solutions is a quality control measure to ensure the concentrations are not used above the established limit.

**Emergency Nature:**

1. The proposed TIA intends to correct a previously unknown existing hazard.
2. The proposed TIA intends to offer to the public a benefit that would lessen a recognized (known) hazard or ameliorate a continuing dangerous condition or situation.

**Attachments:**
- Fire Protection Research Foundation titled *Antifreeze Solutions in Home Fire Sprinkler Systems* dated May 28, 2010
- UL document titled *Fire Test Data Summary for Residential Sprinklers Discharging Antifreeze Mixtures* dated May 26, 2010
Agenda Item: TIA 13D-2010
Reference: 4.1.4, 8.3.3, and Table 8.3.3.2.3 (TIA Log 996)

Comment Closing: 7/23/2010
0 Public Comments Received

TIA TCC BALLOT RESULTS PENDING

According to 5.4 in the NFPA (RGCP), the final results show this TIA HAS/HAS NOT achieved the necessary votes on both Question 1 (Correlation Issues) and Question 2 (Emergency Nature).

The number of affirmative votes needed to obtain a recommendation to issue the TIA is 

\[
\frac{(\text{eligible to vote}) - \text{(not returned)} - \text{(abstentions)}}{0.75} = \text{(this is the simple majority)}
\]

In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required.

0 Eligible to Vote
0 Not Returned

TCC PENDING Ballot results for Correlation Issues are as follows:
0 Affirmative
0 Negative
0 Abstentions

Final Action: PASS/FAIL

TCC PENDING Ballot results for Emergency Nature are as follows:
0 Affirmative
0 Disagreement
0 Abstentions

Final Action: PASS/FAIL

TIA FINAL AUT-RSS TC BALLOT RESULTS
(Ballot results may change due to public comment circulation, if any)

According to 5.4 in the NFPA (RGCP), the final results show this TIA HAS NOT achieved the necessary votes on Question 1 (Technical Merit) and HAS on Question 2 (Emergency Nature).

The number of affirmative votes needed to obtain a recommendation to issue the TIA is 20.

\[
28 \times 0.75 = 19.5
\]

In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required.

28 Eligible to Vote
2 Not Returned (Shaw, Tucker)

TC FINAL Ballot results for Technical Merit are as follows:
12 Affirmative (Bell, Deegan, Schwab, Yu w/comment)
14 Negative (Bradley, Brown, Budnick, Haagensen, Ketner, Killey, O’Brien, Orlowski, Pilette, Rians, Sigler, Skare, Van Walraven, Victor)
0 Abstentions

Final Action: FAILED

TC Final Results continued on next page
TC FINAL Ballot results for **Emergency Nature** are as follows:

24  Affirmative (Deegan w.comment)
2   Disagreement (Pilette, Sigler)
0   Abstentions

**Final Action: PASSED**
Moreau-Correia, Jeanne

From: FCBEngineering@aol.com
Sent: Saturday, July 10, 2010 11:55 AM
To: Moreau-Correia, Jeanne
Subject: TIA's for NFPA 13D and 13R
Attachments: clip_image002.gif

Please indicate my vote as follows:

[ ] TIA 996 - NFPA 13 D Disagree: needs additional testing and research. In favor of TIA 994
   Emergency-Agree

TIA 995 - NFPA 13 R Agree
   Emergency - Agree

TIA 997-NFPA 13 R Disagree: needs additional testing and research. In favor of TIA
995
   Emergency-Agree

TIA 994 Agree
   Emergency - Agree

Frederick C. Bradley, P.E.
Fire Protection Engineer
Alpharetta, Georgia
(770) 643-1628 (W)
(770) 642-8068 (FAX)
www.FCBEngineering.com
FCBEngineering@aol.com
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Rename sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

_____________________ AFFIRMATIVE  __X__ NEGATIVE*  __________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

THE ACTIONS OF TIA LOG NO. 996 SHOULD BE FOLLOWED

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

___X___ AGREEMENT  __________ DISAGREEMENT*  __________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

______________________________
                                                                                     Signature

Phillip A. Brown

Name (Please Print)

07-02-10

Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110

E-mail: jmoreaucorreia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

________ AFFIRMATIVE  ☑ NEGATIVE*  _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

CURRENTLY THE TECHNICAL BASIS, SAFETY FACTORS AND REQUIRED QUALITY CONTROL TO ALLOW A 50/50 CONCENTRATION OF ANTIFREEZE DOES NOT EXIST.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

☑ AGREEMENT  _______ DISAGREEMENT*  _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

__________________________________________

__________________________________________

Edward K. Buonick
Signature
Edward K. Buonick
Name (Please Print)
7/6/10
Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110
E-mail: jmoreau@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

________ AFFIRMATIVE  ✔ NEGATIVE* ________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

SEE ATTACHED


Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

✔ AGREEMENT  ______ DISAGREEMENT* ________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.


Signature

Dana Haagenesen

Name (Please Print)

7/6/2010

Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110
E-mail: jmoreaucorreia@nfpa.org
Dana R. Haagensen   AUT-RSS Ballot   Proposed TIA 994, 995, 996 & 997

TIA 996 (restricted use of antifreeze systems in new NFPA 13D systems)
Question 1: NEGATIVE w/ explanation
Based on the submitted information, there are life safety concerns with the use of antifreeze systems to protect residential occupancies. There appear to be other factors beyond the concentration alone. These factors need to be fully vetted while a temporary moratorium is in effect. It should also be noted that, if the TIA is successful, propylene glycol - 40% water, in the proposed Table 8.3.3.2.3, needs to be deleted so as to avoid a conflict with proposed 8.3.3.1.
Question 2: AGREEMENT

TIA 997 (restricted use of antifreeze systems in new NFPA 13R systems)
Question 1: NEGATIVE w/ explanation
If this TIA is successful, it is recommended that the TIA be REWORDED to satisfy the intent of the submitter – “4.7 Antifreeze concentrations in excess of 50% by volume shall not be permitted within the dwelling unit portions of sprinkler systems to protect inside dwelling units.” The wording of the originally proposed TIA could be interpreted (literally) that antifreeze systems are permitted to protect inside dwelling units so long as the antifreeze solution is not physically within the dwelling unit. With the originally proposed wording, one is permitted to install antifreeze solution in piping that is in the attic serving inside dwelling units because the “antifreeze is not within the dwelling unit portion”. The negative vote is based on the submitted information - there are life safety concerns with the use of antifreeze systems to protect residential occupancies. There appear to be other factors beyond the concentration alone. These factors need to be fully vetted while a temporary moratorium is in effect.
Question 2: AGREEMENT
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumber sections 4.1, 4.3, 8.3.3 and Table 8.3.3.2.3 to the 2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

________ AFFIRMATIVE  X  NEGATIVE*  _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.


Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

 X AGREEMENT  _______ DISAGREEMENT*  _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.


Signature

Name (Please Print)

Date

7-2-10

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

Fax: (617) 984-7110  E-mail: jmoreaucorreia@nfpa.org

Standards Council Supplemental Agenda  August 3-5, 2010  Page 1551 of 1603

Revised Page Number 785 of 837
Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

[ ] AFFIRMATIVE  [X] NEGATIVE*  [ ] ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

Feel more testing must be done to verify the 50/50 mixture is acceptable.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

[ ] AGREEMENT  [X] DISAGREEMENT*  [ ] ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

Signature

Name (Please Print)

Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110

E-mail: jmoreaucorreia@nfpao.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 995
Revised and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured
Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

[ ] AFFIRMATIVE [X] NEGATIVE [ ] ABSTAIN

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

THE PROPOSED CHANGE DOES NOT HAVE SUFFICIENT TECHNICAL
JUSTIFICATION. ADDITIONAL TESTING APPEARS TO BE NECESSARY
ON ADDITIONAL FACTORS AND SAFETY CONCENTRATIONS.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

[X] AGREEMENT [ ] DISAGREEMENT [ ] ABSTAIN

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

______________________________
Signature

Michael O’Rea
Name (Please Print)
7-5-10
Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Morceau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110
E-mail: jmorceau@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996

Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the 2010 Edition of NFPA 13D, Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

______ AFFIRMATIVE  X  ____ NEUTRAL*  _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a negative or abstaining position.

Based upon the testing data provided by UL and the report issued by the Fire Protection Research Center, NAHB votes negatively on the TIA to permit the continued use of a 50/50 antifreeze solution in residential fire suppression systems. It is prudent for this committee to disallow the use of all antifreeze solutions until test results show that the solution does not sustain or proliferate the fire, regardless of where the fire may occur in the dwelling unit. The test results that have been conducted thus far illustrate that a 50/50 solution could pose a threat to life safety and should not be included in the provisions of the NFPA 13D standard prior to any testing being conducted to prove otherwise.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

X  AGREEMENT  _______ DISAGREEMENT*  _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a disagreement or abstaining position.

________________________________
Signature
Steven Orlowski

Name (Please Print)
7/06/2010

Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169 FAX: (617) 984-7110 E-mail: jmcorreia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.5 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured
Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

______ AFFIRMATIVE      X  NEGATIVE*       ______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

Supporting data: Incomplete. No verification that 50% mix is adequate. Additional torts & resources required.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

______ AGREEMENT      X  DISAGREEMENT*       ______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

Incomplete data.

__________________________
Signature

__________________________
Name (Please Print)

__________________________
Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110
E-mail: jmoreau@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

____________________ AFFIRMATIVE  X  NEGATIVE*  ___________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

I feel a total moratorium should be placed on NF Systems until a test is conducted in July or August 2010.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

X AGREEMENT  ___________ DISAGREEMENT*  ___________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

__________________________________________________________

Signature: [Signature]
Name (Please Print): [Name]
Date: [Date]

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110  E-mail: jmoreauncorr@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumbe sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured
Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

________ AFFIRMATIVE  ______ NEGATIVE*  ______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

NO DATA HAS BEEN PRESENTED TO SHOW THAT ANY CONCENTRATION OF ANTIFREEZE IS SAFE, UNTIL APPROVED TESTING CAN BE
CONDUCTED, I CANNOT IN GOOD CONSCIENCE VOTE IN
FAVOR OF THIS TIA.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

_ _ AGREEMENT  _______ DISAGREEMENT*  _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

THIS ISSUE IS AN EMERGENCY, HOWEVER THIS TIA
DOES NOT ADEQUATELY ADDRESS THE ANTIFREEZE
ISSUE IN MY OPINION.

_____________________________
Signature  
MATT SIGLER  - 1APMO

Name (Please Print)  
6-28-10

Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169  
FAX: (617) 984-7110  
E-mail: jmoreaucorreia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

AFFIRMATIVE  X  NEGATIVE*  ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

VOTED AFFIRMATIVE on TIA No.994. EVIDENCE IN SUPPORTING
INFORMATION LEAVES ENOUGH DOUBT ON THE POTENTIAL FOR
FLASH FIRE WITH 50/50 MIXTURE.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

X  AGREEMENT  DISAGREEMENT*  ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

________________________________________

Signature

Name (Please Print)

Date

7/2/10

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169  FAX: (617) 984-7110  E-mail: jmoreaucorreia@nfpa.org
Moreau-Correia, Jeanne

From: Ed Van Walraven [Ed.Van@cl.aspen.co.us]
Sent: Thursday, July 01, 2010 3:50 PM
To: Moreau-Correia, Jeanne
Subject: Ed Van Walraven-PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996

TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

_____________AFFIRMATIVE_______ X _______NEGATIVE* _________ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

______________________________________________________________________________

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

____ X ______ AGREEMENT _______ DISAGREEMENT* _________ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

* As a result of information obtained through a report from the Fire Protection Research Foundation titled Antifreeze Solutions in Home Fire Sprinkler Systems dated May 28, 2010 and data compiled in a UL document titled Fire Test Data Summary for Residential Sprinklers Discharging Antifreeze Mixtures dated May 26, 2010 sufficient technical documentation now exists to highlight safety concerns and knowledge gaps regarding the provisions permitting antifreeze in sprinkler systems protecting dwelling units. Until such time that appropriate research has been conducted to satisfy these concerns and knowledge gaps, the safe use of antifreeze solutions within sprinkler systems protecting dwelling units cannot be assured. Therefore NFPA-13D should not be permitting the use of antifreeze systems within the standard.

Ed Van Walraven
Signature

Ed Van Walraven
Name (Please Print)
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured
Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

__________________________ AFFIRMATIVE ___________ X ___________ NEGATIVE* ___________ ABSTAIN*

EXPLANATION OF VOTE – Please type or print your comments:
*An explanation must accompany a negative or abstaining position.
The preliminary test results at Underwriters Laboratories indicate that a 50/50 % mixture of water and glycerin or water and
propylene glycol does not present any more of a danger of a large scale ignition than 100% water. However, in some
residential occupancies, specifically those with sprinkler systems installed in accordance with NFPA 13D, on-going
maintenance by the home owner may lead to higher concentrations being used than a 50/50 % mixture, which would present
the potential danger of a large scale ignition when the system activates.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

X AGREEMENT ___________ DISAGREEMENT* ___________ ABSTAIN*

EXPLANATION OF VOTE – Please type or print your comments:
*An explanation must accompany a disagreement or abstaining position.

________________________________________

Terry L Victor

Signature

Terry L Victor

Name (Please Print)

July 6, 2010

Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110
E-mail: jmoreaucorreia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumere sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D, Standard for the Installation of Sprinkler Systems in One-
and-Two Family Dwellings and Manufactured Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

_____ AFFIRMATIVE ________ NEGATIVE* __________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a negative or abstaining position.

In the event that TIA 994 does not receive the required support from the Technical Committee, we are voting affirmatively on TIA 996 for the sole reason that immediate action needs to be taken to eliminate reference to antifreeze concentrations that have demonstrated the potential to ignite and create a large-scale spray type fire. There is an urgent need to conduct further research to address knowledge gaps and obtain a more comprehensive understanding of the performance of residential sprinklers discharging antifreeze mixtures including those that contain concentrations of 50% or less. While limiting the antifreeze concentration to 50% represents a move in the right direction, we support suspending the use of antifreeze in new installations in dwelling units until such time research is completed that fills existing knowledge gaps in this area. We support the revisions described in TIA 994 over those referenced in TIA 996.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

_____ AGREEMENT ________ DISAGREEMENT* _________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a disagreement or abstaining position.

__________________________
Kerry M. Bell
Signature

__________________________
Kerry M. Bell
Name (Please Print)

__________________________
6/29/10
Date

Please return the ballot on or before Tuesday, July 6, 2010.
PLease return to:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169 FAX: (617) 984-7110 E-mail: jmoreaucorrela@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

☐ AFFIRMATIVE       ☐ NEGATIVE*      ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

I AGREE THAT LIMITING ANTIFREEZE SOLUTIONS TO NO GREATER
THAN A 50% SOLUTION THAT IS FACTORY PROCESSED IS APPROPRIATE.
THE PROPOSED WRITING OF THE TIA SHOULD BE CAREFULLY REVISED
SO THAT CHANGES ARE CORRECT AND COMPREHENIVE.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

☐ AGREEMENT       ☐ DISAGREEMENT*      ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

This subject is of an Emergency Nature

Signature
Tom Dee Cun
Name (Please Print)
7/9/2010
Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110
E-mail: jmoreaucorretta@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,

*Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes*

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

✓ AFFIRMATIVE _______ NEGATIVE* _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

My comment in the AFFIRMATIVE is that in

TABLE 8.3.3.2.3, THE 60% SOLUTION SHOULD
BE REMOVED. THIS IS CONSISTENT WITH THE 50%
REQUIREMENT.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

✓ AGREEMENT _______ DISAGREEMENT* _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

______________________________
Signature

______________________________
Name (Please Print)

______________________________
Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110
E-mail: jmoreaucorrcia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumbe sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

   X AFFIRMATIVE   _______ NEGATIVE*   _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

   *An explanation must accompany a negative or abstaining position.

   Although FM Global’s position would be to not recommend any concentrations of antifreeze solutions within the water supply of a 13D sprinkler system, we vote affirmative to the position stated in this TIA.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

   X AGREEMENT _____ DISAGREEMENT*   _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

   *An explanation must accompany a disagreement or abstaining position.

__________________________
Signature

__________________________
Name (Please Print)

__________________________
Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169.

FAX: (617) 984-7110
E-mail: jmoreaucorreia@nfpa.org
TIA TCC FINAL BALLOT RESULTS (as of 7/23/10)  
(Ballot results may change due to public comment circulation)  

According to 5.4 in the NFPA (RGCP), the final results show this TIA **HAS NOT** achieved the necessary votes on Question 1 (Correlation Issues) and **HAS** on Question 2 (Emergency Nature).

The number of affirmative votes needed to obtain a recommendation to issue the TIA is **14**.

\[20 \text{ (eligible to vote)} - 2 \text{ (not returned)} - 0 \text{ (abstentions)} = 18 \times 0.75 = 13.5\]

In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required.

\[20 \text{ eligible} ÷ 2 = 10 + 1 = 11 \text{ (this is the simple majority)}\]

**20 Eligible to Vote**

**2 Not Returned (Ketner, Stultz)**

**TCC FINAL** Ballot results for **Correlation Issues** are as follows:

- **11** Affirmative (Bell, Franson, Pirro w/comment)
- **7** Negative (Budnick, Fuller, Hilton, Huggins, Javeri, Leavitt, Underwood)
- **0** Abstentions

**Final Action: FAIL**

**TCC FINAL** Ballot results for **Emergency Nature** are as follows:

- **18** Affirmative (Bell, Javeri w/comment)
- **0** Disagreement
- **0** Abstentions

**Final Action: PASS**

TIA FINAL AUT-RSS TC BALLOT RESULTS  
(Ballot results may change due to public comment circulation)  

According to 5.4 in the NFPA (RGCP), the final results show this TIA **HAS NOT** achieved the necessary votes on Question 1 (Technical Merit) and **HAS** on Question 2 (Emergency Nature).

The number of affirmative votes needed to obtain a recommendation to issue the TIA is **20**.

\[28 \text{ (eligible to vote)} - 2 \text{ (not returned)} - 0 \text{ (abstentions)} = 26 \times 0.75 = 19.5\]

In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required.

\[28 \text{ eligible} ÷ 2 = 14 + 1 = 15 \text{ (this is the simple majority)}\]

**28 Eligible to Vote**

**2 Not Returned (Shaw, Tucker)**

**TC FINAL** Ballot results for **Technical Merit** are as follows:

- **12** Affirmative (Bell, Deegan, Schwab, Yu w/comment)
- **14** Negative (Bradley, Brown, Budnick, Haagensen, Ketner, Killey, O’Brien, Orlowski, Pilette, Rians, Sigler, Skare, Van Walraven, Victor)
- **0** Abstentions

**Final Action: FAIL**

*TC Final Results continued on next page*
TC FINAL Ballot results for Emergency Nature are as follows:
24 Affirmative (Deegan w/comment)
2 Disagreement (Pilette, Sigler)
0 Abstentions

Final Action: PASS
TECHNICAL CORRELATING COMMITTEE
LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and renumber sections 4.1.4, 8.3.3, and Table 8.3.3.2.3 to the 2010 Editions of NFPA
13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured
Homes

Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy
enclosed) of the NFPA Regs.

✓ AGREE  ✓ DISAGREE*  ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant
section(s)/paragraph(s) of the correlation issue and describe.

ACTION TAKEN BY RES ON PROPOSED TIA 996/997 IS IN DIRECT
CONFLICT WITH ACTION TAKEN BY SSE ON PROPOSED TIA 998.

Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

✓ AGREE  ☐ DISAGREE*  ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.

________________________________________
Signature

Edward K. Bunice

Name (Please Print)

7/14/10

Date

Please return the ballot on or before Friday, July 16, 2010

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110
E-mail: jmoreaucorrela@nfpa.org
TECHNICAL CORRELATING COMMITTEE
LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and renumber sections 4.1.4, 8.3.3, and Table 8.3.3.2.3 to the 2010 Editions of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

✓ Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA Regs.

          AGREE  X  DISAGREE*  ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant section(s)/paragraph(s) of the correlation issue and describe.

Log 996 is in conflict with 994.

✓ Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

 X  AGREE  DISAGREE*  ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.

Signature
David B. Fuller

Name (Please Print)
July 16, 2010

Date

Please return the ballot on or before Friday, July 16, 2010

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169  FAX: (617) 984-7110  E-mail: jmoreaucorreia@nfpa.org

Standards Council Supplemental Agenda  August 3-5, 2010  Page 1568 of 1603

Revised Page Number 802 of 837
TECHNICAL CORRELATING COMMITTEE
LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and renumber sections 4.1.4, 8.3.3, and Table 8.3.3.2.3 to the 2010 Editions of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

☑ Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA Regs.

☐ AGREE ☒ DISAGREE* ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite the relevant section(s)/paragraph(s) of the correlation issue and describe.

CONFLICTS WITH TIA #994 WHICH

DOES NOT ALLOW AF

☑ Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

☒ AGREE ☐ DISAGREE* ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.


Signature

Name (Please Print)

Date

☑ Please return the ballot on or before Friday, July 16, 2010

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110 E-mail: jmoreau@nfpa.org
That is correct.

No change to correlation issues balloted for 994, 995, 996, 997

Agreement for emergency nature of 994, 995, 996, 997

Luke Hilton
(704) 248-2788
Ext 24421

Thank you Luke.

I left you a voice message regarding the below statement. Please clarify that you are not changing your correlation issues vote, but voting in agreement on emergency nature for TIA 994, 995, 996, 997.

Best Regards,
Jeanne

That was a mistake.

I meant to mark "agreement" for those four that I marked "disagreement" on correlation issues.
TECHNICAL CORRELATING COMMITTEE
LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and renumber sections 4.1.4, 8.3.3, and Table 8.3.3.2.3 to the 2010 Editions of NFPA
13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured
Homes

Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy
enclosed) of the NFPA Regs.

☑ AGREE ☒ DISAGREE* ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant
section(s)/paragraph(s) of the correlation issue and describe.

---

☑ Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

☒ AGREE ☐ DISAGREE* ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.

---

Signature

Roland Huggins

Name (Please Print)

7/14/10

Date

Please return the ballot on or before Friday, July 16, 2010

PLEASE RETURN TO:

Jeane Moreau

NFPA

1 Batterymarch Park

Quincy, MA 02169

FAX: (617) 984-7110

E-mail: jmoreauorg@nfpao.org

Standards Council Supplemental Agenda

August 3-5, 2010

Page 1571 of 1603

Revised Page Number 805 of 837
TECHNICAL CORRELATING COMMITTEE
LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and renumber sections 4.1.4, 8.3.3, and Table 8.3.3.2.3 to the 2010 Editions of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

√ Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA Regs.

_________ AGREE   _______ DISAGREE*   _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant section(s)/paragraph(s) of the correlation issue and describe.

We should not allow any antifreeze systems in dwelling units until further testing is done.

Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

√ _______ AGREE   _______ DISAGREE*   _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.

The problem is of emergency nature but wording is not consistent with the 993 & 995.

Signature: ____________________________

Name (Please Print): S. Javeri

Date: 16/7/10

Please return the ballot on or before Friday, July 16, 2010

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110

E-mail: jmoreaucorreia@nfpa.org
TECHNICAL CORRELATING COMMITTEE
LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and renumber sections 4.1.4, 8.3.3, and Table 8.3.3.2.3 to the 2010 Editions of NFPA
13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured
Homes

Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy
enclosed) of the NFPA Regs.

AGREE X DISAGREE* ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant
section(s)/paragraph(s) of the correlation issue and describe.

SEE ATTACHED

Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

X AGREE DISAGREE* ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.

__________________________
Signature

__________________________
Name (Please Print)

__________________________
Date

Please return the ballot on or before Friday, July 16, 2010

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110

E-mail: jmoreaucorreia@nfpa.org
Comment for Negative (DISAGREE) Vote

Question 1: TIA Logs 994, 995, 996, 997, 998, and 1000

These proposals are related and cannot be incorporated independent of each other. Regardless of the final action on each, the requirement(s) regarding the use of antifreeze for residential occupancies must be correlated between NFPA 13, 13R, and 13D. At this time it appears that log 998 is the only proposal of the 6 related to this issue that has received the required votes to pass ballot for both technical merit and emergency nature. Log 998 for NFPA 13 cannot be instituted without a consensus on the issue between the three installation standards. In addition, we must not forget that the maintenance requirements found in NFPA 25 related to antifreeze systems must be addressed if any changes to 13 and 13R are approved.
TECHNICAL CORRELATING COMMITTEE
LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and renumber sections 4.1.4, 8.3.3, and Table 8.3.2.2 to the 2010 Editions of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA Regs.

✓ AGREE ✕ DISAGREE* ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant section(s)/paragraph(s) of the correlation issue and describe.

THERE IS A CONFLICT BETWEEN THIS PROPOSED TIA AND

PROPOSED TIA #994:

Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

✓ ✕ AGREE ☐ DISAGREE* ☐ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.

__________________________________________________________

__________________________________________________________

___________________________
Signature
[Signature]

___________________________
Name (Please Print)
Lynn K. Underwood

7/16/10
Date

Please return the ballot on or before Friday, July 16, 2010

PLEASE RETURN TO:
Jeannie Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110
E-mail: jmoreaucarreia@nfpa.org
TECHNICAL CORRELATING COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996

Revise and renumber sections 4.1.4, 8.3.3, and Table 8.3.3.2.3 to the 2010 Edition of NFPA 13D, Standard for the Installation of Sprinkler Systems in One-and Two-Family Dwellings and Manufactured Homes

Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA Regs.

✓ X AGREE ********* DISAGREE* ********* ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant section(s)/paragraph(s) of the correlation issue and describe.

From a correlation standpoint, we believe the restrictions regarding the use of antifreeze in dwelling units should be the same for NFPA 13D, NFPA 13R and 13 based upon information currently available.

Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

✓ X AGREE ********* DISAGREE* ********* ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a negative/disagreement or abstaining position.

Immediate action needs to be taken to eliminate reference to antifreeze concentrations that have demonstrated the potential to ignite and create a large-scale spray type fire.

Kerry M. Bell
Signature

✓ Kerry M. Bell
Name (Please Print)

7/14/10
Date

Please return the ballot on or before Friday, July 16, 2010

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110
E-mail: jmoreaucorreia@nfpa.org
TECHNICAL CORRELATING COMMITTEE

LETTER BALLOT

PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996

Revise and renumber sections 4.1.4, 8.3.3, and Table 8.3.3.2.3 to the 2010 Editions of NFPA 13D,

Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA 13D.

AGREE       DISAGREE*       ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant section(s)/paragraph(s) of the correlation issue and describe.

As long as TIA's 994 and 995 are not adopted and as long as TIA's 996, 997, and 998 are adopted, there are no correlation issues.

Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

AGREE       DISAGREE*       ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.

__________________________
Signature

__________________________
Name (Please Print)

__________________________
Date

Please return the ballot on or before Friday, July 16, 2010

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110
E-mail: jmoreau@correa@nfpa.org

Signature
Scott Fraino
Name (Please Print)

Date
July 15, 2010
TECHNICAL CORRELATING COMMITTEE

LETTER BALLOT

PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and renumber sections 4.1.4, 8.3.3, and Table 8.3.3.2.3 to the 2010 Editions of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

Question 1: I agree that there are no correlation issues in accordance with 3.4.2 and 3.4.3 (copy enclosed) of the NFPA Regs.

X AGREE ___________ DISAGREE* ___________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position. If disagreeing, cite relevant section(s)/paragraph(s) of the correlation issue and describe.

MORE RESEARCH IS NEEDED TO ESTABLISH IF FURTHER RESTRICTIONS ON THE USE OF ANTI-FREEZE SYSTEMS IS REQUIRED.

Question 2: I agree that the subject of this TIA is of an EMERGENCY NATURE.

X AGREE ___________ DISAGREE* ___________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative/disagreement or abstaining position.

_________________________________________
Signature

DONATO PIERO

Name (Please Print)

JULY 21, 2010

Date

Please return the ballot on or before Friday, July 16, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110

E-mail: jmoreaucorreia@nfpa.org

 Standards Council Supplemental Agenda August 3-5, 2010 Page 1578 of 1603

Revised Page Number 812 of 837
Moreau-Correia, Jeanne

From: FCBEngineering@aol.com
Sent: Saturday, July 10, 2010 11:55 AM
To: Moreau-Correia, Jeanne
Subject: TIA's for NFPA 13D and 13R
Attachments: clip_image002.gif

Please indicate my vote as follows:

TIA 996 - NFPA 13 D Disagree: needs additional testing and research. In favor of TIA 994
   Emergency-Agree

TIA 995 - NFPA 13 R Agree
   Emergency - Agree

TIA 997 - NFPA 13 R Disagree: needs additional testing and research. In favor of TIA 995
   Emergency-Agree

TIA 994 Agree
   Emergency - Agree

Frederick C. Bradley
Fire Protection Engineer
Alpharetta, Georgia
(770) 643-1629 (W)
(770) 642-8066 (FAX)
www.FCBEngineering.com
FCBEngineering@aol.com
TECHNICAL COMMITTEE LETTER BALLOT

PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,

Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured
Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

______ AFFIRMATIVE  ______ NEUTRAL  ______ ABSTAIN

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a neutral or abstaining position.

THE ACTIONS OF TIA LOG No. 994 SHOULD BE FOLLOWED

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

______ AGREEMENT  ______ DISAGREEMENT  ______ ABSTAIN

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

______________________________
Signature
Phillip Brown

Name (Please Print)

Date 02-10

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110

E-mail: jmoreaucorreia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One- and Two Family Dwellings and Manufactured
Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

________ AFFIRMATIVE     __________ NEGATIVE*  __________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

CURRENTLY THE TECHNICAL BASIS, SAFETY FACTORS AND
REQUIRED QUALITY CONTROL TO PERMIT A 50/50
CONCENTRATION OF ANTI-FREEZE DO NOT EXIST.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

______ AGREEMENT  ________ DISAGREEMENT*  ________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

__________________________________________
__________________________________________
__________________________________________

Signature
Edward K. Buonick

Name (Please Print)
Edward K. Buonick

Date
7/6/10

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110  E-mail: jmoreau@nfpa.org

Standards Council Supplemental Agenda  August 3-5, 2010  Page 1581 of 1603
Revised Page Number 815 of 837
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured
Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

_________________ AFFIRMATIVE  ___________ NEGATIVE*  ___________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a negative or abstaining position.

______________________________

SEE ATTACHED

______________________________

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

_________________ AGREEMENT  ___________ DISAGREEMENT*  ___________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a disagreement or abstaining position.

______________________________

Signature

Nama (Please Print)

Date

______________________________

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110

E-mail: jmoreau@nfpa.org
TIA 996 (restricted use of antifreeze systems in new NFPA 13D systems)
Question 1: NEGATIVE w/ explanation
Based on the submitted information, there are life safety concerns with the use of antifreeze systems to protect residential occupancies. There appear to be other factors beyond the concentration alone. These factors need to be fully vetted while a temporary moratorium is in effect. It should also be noted that, if the TIA is successful, propylene glycol - 40% water, in the proposed Table 8.3.3.2.3, needs to be deleted so as to avoid a conflict with proposed 8.3.3.1.
Question 2: AGREEMENT

TIA 997 (restricted use of antifreeze systems in new NFPA 13R systems)
Question 1: NEGATIVE w/ explanation
If this TIA is successful, it is recommended that the TIA be REWORDED to satisfy the intent of the submitter - “4.7 Antifreeze concentrations in excess of 50% by volume shall not be permitted within the dwelling unit portions of sprinkler systems to protect inside dwelling units.” The wording of the originally proposed TIA could be interpreted (literally) that antifreeze systems are permitted to protect inside dwelling units so long as the antifreeze solution is not physically within the dwelling unit. With the originally proposed wording, one is permitted to install antifreeze solution in piping that is in the attic serving inside dwelling units because the “antifreeze is not within the dwelling unit portion”. The negative vote is based on the submitted information - there are life safety concerns with the use of antifreeze systems to protect residential occupancies. There appear to be other factors beyond the concentration alone. These factors need to be fully vetted while a temporary moratorium is in effect.
Question 2: AGREEMENT
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured
Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

   AFFIRMATIVE  X   NEGATIVE*  ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

   X   AGREEMENT  DISAGREEMENT*  ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

Signature

Name (Please Print)

Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110

E-mail: jmoreaucorreia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

   AFFIRMATIVE   X   NEGATIVE*   ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

[Handwritten: I feel more testing must be done to verify the 50/50 mixture is acceptable.]

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

   X   AGREEMENT   DISAGREEMENT*   ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

______________________________
Signature: [Signature]

Name (Please Print): [Name]  June 28, 2010

Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110  E-mail: imoreaucorreia@nfpa.org

Revised Page Number 819 of 837
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revised and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

       AFFIRMATIVE  X  NEGATIVE*  ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

THE PROPOSED CHANGE DOES NOT HAVE SUFFICIENT TECHNICAL
JUSTIFICATION. ADDITIONAL TESTING APPEARS TO BE NECESSARY
ON ADDITIONAL FACTORS AND SAFETY CONCERNS.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

       X  AGREEMENT*  DISAGREEMENT  ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

______________________________
Signature:

______________________________
Name (Please Print):

______________________________
Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moréau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110
E-mail: jmoreaucorreia@nfpa.org

Standards Council Supplemental Agenda
August 3-5, 2010
Page 1586 of 1603
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996

Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the 2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and
Manufactured Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as
voting:

_______ AFFIRMATIVE ______ X ______ NEGATIVE* _________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a negative or abstaining position.

Based upon the testing data provided by UL and the report issued by the Fire
Protection Research Center, NAHB votes negatively on the TIA to permit the
continued use of a 50/50 antifreeze solution in residential fire suppression systems. It
is prudent for this committee to disallow the use of all antifreeze solutions until test
results show that the solution does not sustain or proliferate the fire, regardless of
where the fire may occur in the dwelling unit. The test results that have been
conducted thus far illustrate that a 50/50 solution could pose a threat to life safety,
and should not be included in the provisions of the NFPA 13D standard prior to any
testing being conducted to prove otherwise.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please
record me as voting:

_______ X ______ AGREEMENT _______ DISAGREEMENT* _________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a disagreement or abstaining position.

__________________________
Signature
Steven Orlowski
Name (Please Print)
7/06/2010
Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169 FAX: (617) 984-7110 E-mail: jmoreaucorreia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Re-number sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One and Two Family Dwellings and Manufactured Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

AFFIRMATIVE   X   NEGATIVE*   ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

Supposedly 75% in completeness No verification
That 50% Mix is assumed - Additional
Testing & Records Required

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

AGREEMENT   X   DISAGREEMENT*   ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

Incomplete Data

Signature

Name (Please Print)

Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110  E-mail: jmoreau@nfpa.org

August 3-5, 2010
Standards Council Supplemental Agenda
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured
Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

________ AFFIRMATIVE    ☒ NEGATIVE*    ______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*I feel a total moratorium should be placed on all NF Systems until June 30 is
conducted in July 2010

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

☒ AGREEMENT    ______ DISAGREEMENT*    ______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*I feel the moratorium should be placed on all NF Systems until June 30 is
conducted in July 2010

_______________________________________

Signature

[Signature]

Name (Please Print)

[Name]

Date

[Date]

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110
E-mail: jmoreaucorrela@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumbe sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured
Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

________ AFFIRMATIVE     X    NEGATIVE*      _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

No data has been presented to show that any concentration of antifreeze is safe. Until approved tests are conducted, I cannot in good conscience vote in favor of this TIA.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

_____ AGREEMENT     X    DISAGREEMENT*      _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

This issue is an emergency; however, this TIA does not adequately address the antifreeze issue in my opinion.

[Signature]
Matt Sigler - IAPMO
Name (Please Print)
6-28-10
Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110
E-mail: jmoreaucorreia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured
Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

AFFIRMATIVE  X  NEGATIVE*  ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

VOTED AFFIRMATIVE on TIA No.994. EVIDENCE IN SUPPORTING
INFORMATION LEAVES ENOUGH DOUBT ON THE POTENTIAL FOR
FLASH FIRE WITH 50/50 MIXTURE.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

X  AGREEMENT  DISAGREEMENT*  ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

________________________________________

Signature

Eric Skare

Name (Please Print)

7/2/10

Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169  FAX: (617) 984-7110  E-mail: jmoreau.correia@nfpa.org
Moreau-Correia, Jeanne

From: Ed Van Walraven [Ed.Van@cl.aspen.co.us]  
Sent: Thursday, July 01, 2010 3:50 PM  
To: Moreau-Correia, Jeanne  
Subject: Ed Van Walraven-PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996

TECHNICAL COMMITTEE LETTER BALLOT  
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996  
Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the  
2010 Edition of NFPA 13D,  
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

________________ AFFIRMATIVE  
X NEGATIVE  
________________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

________________

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

X AGREEMENT  
DISAGREEMENT  
________________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

* As a result of information obtained through a report from the Fire Protection Research Foundation titled Antifreeze Solutions in Home Fire Sprinkler Systems dated May 28, 2010 and data compiled in a UL document titled Fire Test Data Summary for Residential Sprinklers Discharging Antifreeze Mixtures dated May 26, 2010 sufficient technical documentation now exists to highlight safety concerns and knowledge gaps regarding the provisions permitting antifreeze in sprinkler systems protecting dwelling units. Until such time that appropriate research has been conducted to satisfy these concerns and knowledge gaps, the safe use of antifreeze solutions within sprinkler systems protecting dwelling units cannot be assured. Therefore NFPA-13D should not be permitting the use of antifreeze systems within the standard.

Ed Van Walraven  
Signature

Ed Van Walraven  
Name (Please Print)
Supplemental Attachment 10-8-17-b

TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,

Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

AFFIRMATIVE  X  NEGATIVE*  ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a negative or abstaining position.
The preliminary test results at Underwriters Laboratories indicate that a 50/50 % mixture of water and glycerin or water and propylene glycol does not present any more of a danger of a large scale ignition than 100% water. However, in some residential occupancies, specifically those with sprinkler systems installed in accordance with NFPA 13D, on-going maintenance by the home owner may lead to higher concentrations being used than a 50/50 % mixture, which would present the potential danger of a large scale ignition when the system activates.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

X AGREEMENT DISAGREEMENT* ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a disagreement or abstaining position.

Terry L Victor

Signature

Terry L Victor

Name (Please Print)

July 6, 2010

Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110  E-mail: jmoreaurreia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D, Standard for the Installation of Sprinkler Systems in One-
and-Two Family Dwellings and Manufactured Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me
as voting:

______ AFFIRMATIVE ________ NEGATIVE* _________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a negative or abstaining position.

In the event that TIA 994 does not receive the required support from the Technical Committee,
we are voting affirmatively on TIA 996 for the sole reason that immediate action needs to be
taken to eliminate reference to antifreeze concentrations that have demonstrated the potential to
ignite and create a large-scale spray type fire. There is an urgent need to conduct further
research to address knowledge gaps and obtain a more comprehensive understanding of the
performance of residential sprinklers discharging antifreeze mixtures including those that contain
concentrations of 50% or less. While limiting the antifreeze concentration to 50% represents a
move in the right direction, we support suspending the use of antifreeze in new installations in
dwelling units until such time research is completed that fills existing knowledge gaps in this area.
We support the revisions described in TIA 994 over those referenced in TIA 996.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE,
please record me as voting:

______ AGREEMENT ________ DISAGREEMENT* _________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a disagreement or abstaining position.

________________________ Signature

________________________ Name (Please Print)

________________________ Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169  FAX: (617) 984-7110 E-mail: jmoreau@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Re-number sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

X AFFIRMATIVE _______ NEGATIVE* _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a negative or abstaining position.

I AGREE THAT LIMITING ANTIFREEZE SOLUTIONS TO NO GREATER THAN A 50% SOLUTION THAT IS FACTORY PRODUCED IS APPROPRIATE.
THE PROPOSED WORDING OF THE TIA SHOULD BE CAREFULLY REVIEWED SO THAT CHANGES ARE CORRECT AND COMPREHENSIVE.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

X AGREEMENT _______ DISAGREEMENT* _______ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:
*An explanation must accompany a disagreement or abstaining position.

THIS SUBJECT IS OF AN EMERGENCY NATURE

[Signature]

Name (Please Print)

Date

7/6/2010

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169
FAX: (617) 984-7110
E-mail: jmoreau@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured
Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

✓ AFFIRMATIVE    ___ NEGATIVE*    ___ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

MY COMMENT IN THE AFFIRMATIVE IS THAT IN TABLE 8.3.3.2.3 THE 60% SOLUTION SHOULD
BE REMOVED. THIS IS CONSISTENT WITH THE 50% REQUIREMENT.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

✓ AGREEMENT    ___ DISAGREEMENT*    ___ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

________________________________________
Signature

[Signature]

Name (Please Print)

[Name]

Date

[Date: 6/29/10]

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169

FAX: (617) 984-7110

E-mail: jmoreaucorrceia@nfpa.org
TECHNICAL COMMITTEE LETTER BALLOT
PROPOSED TENTATIVE INTERIM AMENDMENT LOG NO. 996
Revise and Renumber sections 4.1.4, 8.3.3 and Table 8.3.3.2.3 to the
2010 Edition of NFPA 13D,
Standard for the Installation of Sprinkler Systems in One-and-Two Family Dwellings and Manufactured Homes

Question 1: With respect to the TECHNICAL MERITS of the Proposed TIA, please record me as voting:

   X AFFIRMATIVE    _________ NEGATIVE*    _________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a negative or abstaining position.

   Although FM Global’s position would be to not recommend any concentrations of antifreeze solutions within the water supply of a 13D sprinkler system, we vote affirmative to the position stated in this TIA.

Question 2: With respect to the judgment that the subject is of an EMERGENCY NATURE, please record me as voting:

   X AGREEMENT    _________ DISAGREEMENT*    _________ ABSTAIN*

EXPLANATION OF VOTE - Please type or print your comments:

*An explanation must accompany a disagreement or abstaining position.

______________________________
Signature

______________________________
Name (Please Print)

______________________________
Date

Please return the ballot on or before Tuesday, July 6, 2010.

PLEASE RETURN TO:
Jeanne Moreau
NFPA
1 Batterymarch Park
Quincy, MA 02169. FAX: (617) 984-7110
E-mail: jmoreaucorreia@nfpa.org
July 20, 2010

Secretary, Standards Council
National Fire Protection Association
1 Batterymarch Park
Quincy, Massachusetts 02169-7471

Subject: Public Comments for TIA 994, 995, 996, 997 – No Support

Dear Secretary, Standards Council:

As the Acting State Fire Marshal for California (CAL FIRE – Office of the State Fire Marshal) I have carefully reviewed the proposed TIAs referenced above. I found that within the limited research conducted by the Fire Protection Research Foundation titled Antifreeze Solutions in Home Fire Sprinkler Systems dated May 28, 2010, and limited data compiled in a UL document titled Fire Test Data Summary for Residential Sprinklers Discharging Antifreeze Mixtures dated May 26, 2010 it appears there is still much needed detailed research and testing to be conducted on the issue of antifreeze additives to residential fire sprinkler systems.

Understandably, the two above referenced reports highlight a safety concern and knowledge gap, but it is important to remember that this project was conducted on a very limited scale in a very short period of time. It should also be noted that sound research should be conducted to determine the contributing factors to the negative results. The preliminary information of the tests indicated that higher pressures of certain concentrations contributed to a negative conclusion; and we believe the use of antifreeze should be examined and/or suggested for a limited application. Detailed research is essential before there is a complete elimination of the product use.

As a second point, now is the appropriate time for the technical committees to review the standards applying to residential fire sprinklers and determine if improved technology and methods of installation should be more readily identified, recognized, and utilized; thus supersede and/or limit the use of antifreeze.

I respectfully and greatly appreciate your consideration of this vitally important fire and life safety issue.

Sincerely,

[Signature]

TONYA L. HOOVER
Acting State Fire Marshal
Subject: FW: TIA Antifreeze 13D

From: John Brighton
To: Lake, Jim
Cc: brighton1@earthlink.net
Sent: Mon Jul 19 17:41:26 2010
Subject: TIA Antifreeze 13D

Good afternoon Mr. Lake,

I vehemently believe that the testing on 50/50 glycerin antifreeze solution must be completed prior to a final decision being made on its or use or prohibition in 13D systems. Our company has installed literally hundreds of 13D systems over the years, and we maintain hundreds annually that contain glycerin antifreeze. To consider draining these systems and filling them with water is simply not an option in our region where temperatures frequently drop below 0 degrees during winter months. To think that these homes could somehow be retrofitted through an insulation process to protect a fire sprinkler system is simply inconceivable. Life Safety Fire Protection, Inc has been in business for more than twenty years and has broad experience in the residential market.

Thank you,

John M. Brighton
President
Life Safety Fire Protection, Inc.
97 Lower Jaffrey Road
Dublin, NH 03444
603-563-7700
Cell 603-801-7281
Fax: 603-563-7070
john@lifesafetyfire.com
July 20, 2010

Secretary
Standards Council
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471

RE: TIA 994, TIA 995, TIA 996, TIA 997, TIA 998, and TIA 1000

Dear Sir:

On July 13, 2010, the Utah Fire Prevention Board met in a regularly scheduled Board meeting to address a number of fire prevention concerns in the State of Utah. One of those items of discussion was the Safety Alert issued by the National Fire Protection Association (NFPA) with regard to the use of antifreeze in automatic fire sprinkler systems in a residential setting.

The Utah Fire Prevention Board is the overseeing authority for fire prevention in the State of Utah. The Board members are appointed by the Governor of the State of Utah and consists of ten members from various disciplines. The Board has statutory authority over the Office of the State Fire Marshal, oversight of the fire code which is adopted statewide by the Utah State Legislature, firefighter training, certification and licensing of several different fire oriented disciplines, fireworks, fire incident reporting, etc. The Utah Fire Prevention Board has been in existence with that statutory authority since it’s inception in 1964.

The Board’s discussion and comments received were in response to the Safety Alert issued by NFPA that directed that all residential fire sprinkler systems that use antifreeze, have the antifreeze drained and refilled with water. The Board also discussed the several proposed TIAs that would affect the continued use of antifreeze in the State of Utah in residences. The Board also discussed the study conducted by The Fire Protection Research Foundation on the use of antifreeze in a residential setting, and the many places throughout that document requesting that further research or further study needs to be completed to bring this concern to a complete understanding.

The Board felt that this is a very complex and diverse concern for there are large numbers of these types of systems in the State of Utah alone. The Board wanted to convey to those at the National Fire Protection Association that the initial interim direction by NFPA to drain the antifreeze out and refill with water simply will not work in the State of Utah. There would be hundreds of thousands of dollars of water damage from broken pipes that would freeze in the first winter season. In the higher elevations in the State of Utah, winter begins in approximately eight weeks. In the coldest portion of winter, all of the State of Utah will be subject to freezing winter temperatures, and some areas will be near or below 0 degrees Fahrenheit and stay there for an extended period of time. With current designs and piping layout, it is impossible to insulate and expect the systems to not freeze and break.

The Utah Fire Prevention Board strongly urges NFPA that before there are directions given from the largest fire prevention organization in the world, that all the technical data needs to be collected and fully analyzed for validity. The Board understands that there could be a problem with the usage of antifreeze in a residential setting that will need some correction. The Board feels though, that the direction given from NFPA to drain the antifreeze and refill with water will cause a much greater problem than leaving the antifreeze in it’s current form.
The Board asks that the current Technical Interim Amendments, TIA 994, 995, 996, 997, 998, and 1000 either be denied or placed on hold till all data can be fully studied. Just draining out the antifreeze and replacing it with water creates a far bigger problem than it corrects. Direction from NFPA for occupants in residences using antifreeze to immediately leave the residence in the event of fire, has a much more practical and attainable application than just draining the system.

Antifreeze systems have been in use in this country since the 1940s, and their usage is now so interwoven throughout our fire protection systems, that temporary and costly interim direction from NFPA will due more long term damage than leaving the systems intact as they currently exist until all research has been completed and analyzed. The perception of the citizens we serve is paramount to the success of any effort in preventing loss of life and property from the ravages of fire. Hasty response or incomplete solutions will quickly erode the confidence of our citizens that has taken years for the fire service to attain in the State of Utah.

The full interest of the Utah Fire Prevention Board is the betterment of the citizens of the State of Utah with regard to fire and life safety. We as the Fire Prevention Board for the State of Utah, respectfully submit this to you as Secretary of the Standards Council for their review.

Sincerely,

Ted Black, Chairman
Utah Fire Prevention Board

cc: Fire Prevention Board members
Ron L. Morris
State Fire Marshal

Utah State Fire Chiefs Association

Fire Marshal’s Association of Utah

Raymond B. Bizal
NFPA

Lana Taylor
Assistant Attorney General
Please indicate in which format you wish to receive your ROP/ROC  
(Note: If choosing the download option, you must view the ROP/ROC from our website; no copy will be sent to you.)

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<thead>
<tr>
<th>Date</th>
<th>7/21/2010</th>
<th>Name</th>
<th>Jason S. Haire</th>
<th>Tel. No.</th>
<th>303-425-0898</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company</td>
<td>Code Fire, LLC</td>
<td>Email</td>
<td><a href="mailto:jhaire@codefirellc.com">jhaire@codefirellc.com</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Street Address</td>
<td>4896 Van Gordon Street</td>
<td>City</td>
<td>Wheat Ridge</td>
<td>State</td>
<td>CO</td>
</tr>
</tbody>
</table>

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Please indicate organization represented (if any)

1. (a) NFPA Document Title  
   - Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes
   - NFPA No. & Year 13D, 2010

2. Comment on Proposal No. (from ROP): TIA No. 996

3. Comment Recommends (check one): [ ] new text  [X] revised text  [ ] deleted text

4. Comment (include proposed new or revised wording, or identification of wording to be deleted): [Note: Proposed text should be in legislative format; i.e., use underscore to denote wording to be inserted (inserted wording) and strike-through to denote wording to be deleted (deleted wording.)]

   4.1.4.1 Only Factory premixed solutions shall be permitted. The concentration of antifreeze solutions shall be tested under the provisions of 8.3.3.2.7 to demonstrate the solutions do not exceed 50% by volume.

5. Statement of Problem and Substantiation for Comment: (Note: State the problem that would be resolved by your recommendation; give the specific reason for your Comment, including copies of tests, research papers, fire experience, etc. If more than 200 words, it may be abstracted for publication.)

   2010 NFPA 13D-8.3.3.2.7 already requires the solution be tested to determine specific gravity (and consequently solution % by volume) regardless of the solution source. The proposed requirement limiting source to Factory premixed solutions only could present an increase in cost, especially in large or multiple systems where bulk purchase of C.P. or USP grade concentrates are more economical.

6. Copyright Assignment
   
   (a) [X] I am the author of the text or other material (such as illustrations, graphs) proposed in the Comment.
   
   (b) [ ] Some or all of the text or other material proposed in this Comment was not authored by me. Its source is as follows: (please identify which material and provide complete information on its source)

   I hereby grant and assign to the NFPA all and full rights in copyright in this Comment and understand that I acquire no rights in any publication of NFPA in which this Comment in this or another similar or analogous form is used. Except to the extent that I do not have authority to make an assignment in materials that I have identified in (b) above, I hereby warrant that I am the author of this Comment and that I have full power and authority to enter into this assignment.

Signature (Required)

PLEASE USE SEPARATE FORM FOR EACH COMMENT

Mail to: Secretary, Standards Council - National Fire Protection Association
1 Batterymarch Park - Quincy, MA 02169-7471 OR
Fax to: (617) 770-3500 OR Email to: proposals_comments@nfpa.org

7/23/2010

Standards Council Supplemental Agenda August 3-5, 2010

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Revised Page Number 836 of 837
July 23, 2010

Secretary, Standards Council
NFPA
1 Batterymarch Park
Quincy, MA
02169-7471

To Whom it May Concern,

Please accept the following comment regarding TIA 996.

TIA 996 proposes a reasonable approach to the concern regarding the use of antifreeze solutions in sprinkler systems. This approach continues the proven life safety benefit of sprinkler systems while reasonably addressing safety concerns regarding the use of antifreeze systems. The Tahoe Douglas Fire Protection District serves an area in which below freezing temperatures can be expected nine months per year. Antifreeze is the only freeze protection option for the majority of these occupancies.

The Tahoe Douglas Fire Protection District supports TIA 996, but believes that the proposed changes will take time to implement.

Please do not hesitate to call if you have any questions.

Sincerely

Mark Novak
Fire Marshal