FLAMMABLE AND COMBUSTIBLE LIQUIDS CODE COMMITTEE

MEMORANDUM

TO: NFPA 30 Technical Committee on Storage and Warehousing of Containers and Portable Tanks

FROM: R. P. Benedetti

DATE: August 1, 2012

SUBJECT: Agenda for NFPA 30 First Draft Meeting
August 28, 2012, 8:00 AM to 5:00 PM
August 29, 2012, 8:00 AM to 12:00 PM

Ladies and Gentlemen:

Attached is the Agenda for the NFPA 30, Flammable and Combustible Liquids Code, First Draft meeting of the NFPA 30 Technical Committee on Storage and Warehousing of Containers and Portable Tanks, to be held 8:00 AM to 5:00 PM, Tuesday, August 28, 2012 and 8:00 AM to 12:00 PM, Wednesday, August 29, 2012, at the National Fire Protection Association offices, Quincy MA.

This Agenda will also be posted to the NFPA 30 Document Information Page at http://www.nfpa.org/aboutthecodes/list_of_codes_and_standards.asp

If you have additional items for the Agenda, please bring them with you to the meeting.

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FLAMMABLE AND COMBUSTIBLE LIQUIDS CODE COMMITTEE

AGENDA — NFPA 30 First Draft Meeting

NFPA 30 Technical Committee on Storage and Warehousing of Containers and Portable Tanks
National Fire Protection Association
Quincy MA
Tuesday, August 28, 2012, 8:00 AM to 5:00 PM
Wednesday, August 29, 2012, 8:00 AM to 12:00 PM

1. Call to Order.

2. Introduction of Attendees. Update of Committee Roster. [Attachment № A1]

3. Approval of Minutes of Last Meeting. [September, 2010, Rosemont IL] [Attachment № A2]

4. Report of Committee Chair.

5. Report of Staff Liaison.
   • Technical Committee Scope. [Attachment № A3]
   • Technical Committee Membership Status.
     - Special enforcer Emphasis Program.
     - Alternate Member Emphasis Program.
   • Balance of Interests. [Attachment № A3]
   • Document Revision Schedule for Annual 2014 Cycle. [Attachment № A4]

6. Member Reports on Current Issues. [As Necessary]

   [Attachments Nos. A5 and A5A]

8. Tables 16.5.2.9 and 16.5.2.10 – expansion to Include Liquid Classes IB and IC.
   - Tests on which these tables are based were done using heptane as the stored commodity.
   - Originally dropped from tables due to bonding/grounding issues.

9. Recent Correspondence. [NONE]

10. Old Business.
   • Paragraphs 9.1.4(3) and 10.1.3(3) need to be amended to apply only to alcoholic beverages of 100 proof or less, because NFPA 13 does not apply to beverages greater than 100 proof.
   • Conflicts between 9.6.1 and 12.8.2:
     - The quantity limit on Class IIIB liquids in 12.8.2(5) should be more generous, since Table 9.6.1 allows almost this amount with no coverage at all.
     - Section 16.3: Provision needed to address sloped ceilings.

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In Figures 16.4.1(b) and (c), end statement should read "Protect in accordance with criteria identified by 16.3.5". (Not 16.5.6)
Need to address failed mineral seal oil tests using K25 sprinklers.
Need to clarify calculations for spill control / containment.


- Definition of "Liquid Warehouse" (3.3.58.2): Clarify that the 25 percent criterion applies to the perimeter of the liquid storage area, not the whole building.
- Does a van trailer qualify as a storage building?
- Table 9.4.3: Can a UN6HA1 drum (rigid polyethylene primary container slip-fitted into a standard steel drum with weep holes) be considered a metal container?
- Section 9.5: Should there be a prohibition on storage directly on top of or over the cabinet? Should this section address other containers, e.g., aerosol cans; small LP-gas containers?
- Table 9.6.1, Footnote 1: On what basis are safety cans equivalent to flammable liquids storage cabinets for the purpose of doubling the quantities?
- Revise Figure 16.4.1(a) to include a path to "The storage is unprotected – see Table 12.6.2.2." This would correlate with Figures 16.4.1(b) and (c).
- Revise all entries in 16.5.1.10 to include a cross-reference to the table(s) where used.
- Revise 16.5.1.10(3) to read "Layout C . . . above the floor, except over the top level of storage . . . ."
- Tables 16.5.2.9 and 16.5.2.10: Can these criteria be extended to cover 5-gallon plastic containers that store a Class II liquid? (Example: paints with 20% mineral spirit)
- Revise A.9.5.5 to accurately reflect the addition of a reference to ASTM D4956, as shown in the A2011 ROC, Comment 30-7, page 30-6.

12. Schedule Next Meeting(s).

### Storage and Warehousing of Containers and Portable Tanks

#### Flammable and Combustible Liquids

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## Storage and Warehousing of Containers and Portable Tanks

### Flammable and Combustible Liquids

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*Robert P. Benedetti*  
*FLC-SWC*

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<td>NFPA Industrial Fire Protection Section</td>
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## Storage and Warehousing of Containers and Portable Tanks

### Flammable and Combustible Liquids

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<th>Name</th>
<th>Title</th>
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<tbody>
<tr>
<td>Duane L. Rehmeyer</td>
<td>Alternate</td>
<td>Baker Engineering &amp; Risk Consultants, Inc.</td>
<td>709 Highspire Road, Glenmore, PA 19343</td>
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<td></td>
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<tr>
<td>Arthur M. Stevens</td>
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<td>400 Beech Tree Lane, Longwood, FL 32779</td>
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<td></td>
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<td>Justrite Manufacturing Company, LLC</td>
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<tr>
<td>Christopher J. Wieczorek</td>
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<td>FM Global</td>
<td>1151 Boston-Providence Turnpike, PO Box 9102</td>
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<td>Norwood, MA 02062-9102</td>
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<tr>
<td>Robert P. Benedetti</td>
<td>Staff Liaison</td>
<td>National Fire Protection Association</td>
<td>1 Batterymarch Park, Quincy, MA 02169-7471</td>
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<tr>
<td>Ronald J. Stephens</td>
<td>Alternate</td>
<td>Allan Automatic Sprinkler Corp. of So. California</td>
<td>3233 Enterprise Street, Brea, CA 92821</td>
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<td>David C. Swenson</td>
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<td>The Sherwin-Williams Company</td>
<td>333 Republic Building, 101 Prospect Avenue</td>
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<td>1 Batterymarch Park, Quincy, MA 02169-7471</td>
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08/01/2012

Robert P. Benedetti

FLC-SWC
National Fire Protection Association
1 Batterymarch Park, Quincy, MA 02169-7471
Phone: 617-770-3000 • Fax: 617-770-0700 • www.nfpa.org

FLAMMABLE AND COMBUSTIBLE LIQUIDS CODE COMMITTEE

Minutes of Report on Comments (ROC) Meeting

NFPA 30 Technical Committee on Storage and Warehousing of Containers and Portable Tanks
Sheraton Gateway Suites O'Hare Airport
Rosemont IL
September 27 and 28, 2010

I. Participation

T. D. Bellamy, Telgian Corporation (Rep. The Home Depot)
G. A. Carter, Justrite Manufacturing Company, LLC
E. S. Goldhammer, Aon Fire Protection
D. H. Havens, Bechtel Marine Propulsion Corp. / Knowles Atomic Power Laboratories
D. J. Hess, 3M Company
D. B. Hicks, Dow Corning Corporation (Rep. NFPA Industrial Fire Protection Section
D. C. Kirby, Baker Engineering & Risk Consultants
J. A. LeBlanc, FM Global, CHAIR
T. S. Lentz, Aon Risk Services, Inc.
C. A. Martens, Lake Havasu City Fire Department (via web conference - 9/27 only)
R. McKim, Liberty Mutual Property
(Rep. Property Casualty Insurers Association of America)
A. M. Ordile, Haines Fire & Risk Consulting, Inc.
D. P. Nugent, Valspar Corporation
M. J. Pabich, Underwriters Laboratories Inc.
L. T. Rindfuss, Marsh USA Inc.
D. A. Rivers, 3M Company
J. L. Scheffey, Hughes Associates, Inc. (9/27 only)
G. A. Seuss, Jr., Verlan Fire Insurance Company / Hanover Group
(via web conference)
R. J. Stephens, Allan Automatic Sprinkler Corp. of Southern California
(Rep. National Fire Sprinkler Association)
B. Tate, Office of the Fire Marshal – Ontario (via web conference)
P. J. G. Willse, XL Global Asset Protection Services (via web conference - 9/27 only)
J. Woycheese, Hughes Associates, Inc.

R. P. Benedetti, National Fire Protection Association, STAFF LIAISON
P. E. May, National Fire Protection Association, STAFF LIAISON

GUESTS: J. Barber, RCP Incorporated
C. DeTaeye, Travelers Insurance
B. Minnich, Schuetz Container Systems
J. Richmond, Eastman Chemical Company
II. Minutes

1. The meeting was called to order at 1:15 PM.

2. Attendees introduced themselves. The Technical Committee roster was corrected as necessary.

3. The Minutes of the previous meetings were unanimously approved as amended with the following corrections and additions:

   - Lee Rindfuss was added to the attendance list.
   - The Container Protection Criteria Task Group submitted a report that included the Task Group’s recommendations on applicable proposals to amend NFPA 30 and its recommendations for four future projects to be conducted under the auspices of the Fire Protection Research Foundation.

4. Technical Committee Chair John LeBlanc had no report to present.

5. The Staff Liaison reported on the following items:

   - Scopes of Technical Correlating Committee and Technical Committees. The Technical Committee agreed that the Committee scope is in need of change and directed the Staff Liaison to proceed with same.
   - Membership Status. The Staff Liaison reported on recent changes to committee membership and on the balance of interests on the committees.
   - Document Revision Schedule for NFPA 30-2012. The Staff Liaison reviewed the deadlines in the revision schedule for NFPA 30-2012.

6. There were no current issues to report to the Technical Correlating Committee.

7. The Technical Committee received no public comments on their Report on Proposals (ROP) on NFPA 30-2012. Based on some issues brought to the table by committee members, the Technical Committee generated three comments of its own.

   The Staff Liaison was directed to proceed with the letter ballot for the Report on Comments to NFPA 30-2012.

8. There was no recent correspondence requiring the Technical Correlating Committee’s attention.

9. Under “Other Old Business”:

   - The Technical Committee identified necessary corrections to be made to the text of NFPA 30.

10. Under New Business, the Technical Committee identified the following areas that need attention:

   - 9.1.4(3) and 10.1.3(3) need to be amended to apply only to alcoholic beverages of 100 proof or less. This covers a gap between NFPA 13, which specifically does not apply beyond 100 proof, and NFPA 30.
   - Conflicts between 9.6.1 and 12.8.2:
     - The title needs to be changed to read “General Purpose Warehouses”.
     - Need to resolve poor wording of 12.3.1 & 12.3.2.
     - Need to eliminate limit on Class IIIIB, because 9.6.1 allows unlimited.
     - Subsection 9.6.1 probably should specify level of protection for doubling of MAQ with sprinklers.
   - Section 16.3 needs a provision for guidance for sloped ceilings.
   - In Figures 16.4.1(b) & (c), end statements should say “Protect as identified in 16.3.6.”
   - Address failed mineral seal oil tests involving K25 sprinklers
   - Need to clarify calculations for spill control and containment.
11. The Technical Committee deferred planning for the next meeting cycle until the production of the 2012 edition of NFPA 30 is completed.

12. The meeting adjourned at 12:30 PM on September 28, 2012.
FLAMMABLE AND COMBUSTIBLE LIQUIDS CODE COMMITTEE

SCOPE STATEMENTS

Technical Correlating Committee on Flammable & Combustible Liquids

This Committee shall have primary responsibility for documents on safeguarding against the fire and explosion hazards associated with the storage, handling, and use of flammable and combustible liquids; and classifying flammable and combustible liquids.


Technical Committee on Fundamentals of Flammable & Combustible Liquids

This Committee shall have primary responsibility for documents or portions of documents on the basic requirements for safeguarding against the fire and explosion hazards associated with the storage, handling, and use of flammable and combustible liquids. This Committee shall also have responsibility for definitions related to flammable and combustible liquids and for criteria for the classification of flammable and combustible liquids.

Responsible for Chapters 1 of NFPA 30, Flammable and Combustible Liquids Code.

Technical Committee on Operations

This Committee shall have primary responsibility for documents or portions of documents on safeguarding against the fire and explosion hazards associated with operations that involve the handling, transfer, and use of flammable and combustible liquids, either as a principal activity or as an incidental activity.

Responsible for Chapters 5 and 6 and Appendix F of NFPA 30, Flammable and Combustible Liquids Code.

Technical Committee on Storage & Warehousing of Containers & Portable Tanks

This Committee shall have primary responsibility for documents or portions of documents on safeguarding against the fire and explosion hazards associated with the storage, warehousing, and display merchandising of flammable and combustible liquids in containers and in portable tanks whose capacity does not exceed 2500 liters (660 gallons).

Responsible for Chapter 4 and Appendices D and E of NFPA 30, Flammable and Combustible Liquids Code.

Technical Committee on Tank Storage & Piping Systems
This Committee shall have primary responsibility for documents or portions of documents on safeguarding against the fire and explosion hazards associated with the storage of flammable and combustible liquids in fixed aboveground and underground tanks of any size, including tanks in buildings, except as specifically covered by other NFPA documents, and with the installation of piping systems for flammable and combustible liquids. This Committee shall also have primary responsibility for documents or portions of documents on safeguarding against the fire and explosion hazards associated with the storage of flammable and combustible liquids in portable tanks whose capacity exceeds 2500 liters (660 gallons).

Responsible for Chapters 2 and 3 and Appendices B and C of NFPA 30, Flammable and Combustible Liquids Code, and NFPA 395, Standard for the Storage of Flammable and Combustible Liquids at Farms and Isolated Sites.

**COMMITTEE MEMBERSHIP BALANCE**

**TCC on Flammable & Combustible Liquids - FLC-AAC**

- **Principals:** 9  M: 2 (22%) U: 1 (11%)
- **Voting Alternates:** 0  I/M: 0 L/C: 0
- **Alternates:** 5  R/T: 1 (11%) E: 1 (11%)
- **Non-Voting:** 3  I: 2 (22%) SE: 2 (22%)
- **Emeritus:** 3
- **Task Group:** 0
- **Hold List:** 0  Balance: OK

*(containers: 1  liquids: 1)*

**T/C on Fundamentals of Flammable & Combustible Liquids**

- **Principals:** 29  M: 8 (28%) U: 3 (10%)
- **Voting Alternates:** 0  I/M: 0 L/C: 0
- **Alternates:** 7  R/T: 2 (7%) E: 4 (14%)
- **Non-Voting:** 1  I: 6 (21%) SE: 6 (21%)
- **Emeritus:** 0
- **Task Group:** 0
- **Hold List:** 4  Balance: OK

*(containers: 1  liquids: 6  tanks: 1)*

**T/C on Operations**

- **Principals:** 27  M: 8 (30%) U: 5 (18%)
- **Voting Alternates:** 0  I/M: 0 L/C: 0
- **Alternates:** 13  R/T: 1 (4%) E: 2 (7%)
- **Non-Voting:** 2  I: 6 (22%) SE: 5 (18%)
- **Emeritus:** 0
- **Task Group:** 0
- **Hold List:** 2  Balance: OK

*(liquid handling equipment: 1  liquids: 7)*
## T/C on Storage & Warehousing of Containers & Portable Tanks

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| **(containers: 3 liquids: 4 safety cabinets & cans: 1 fire suppression equipment: 1)**

## T/C on Tank Storage & Piping Systems

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| **(fire suppression systems: 0 tanks: 2 tank appurtenances: 1 vaults: 0 liquid handling equipment: 2)**
# 2014 ANNUAL REVISION CYCLE

*Public Input Dates may vary according to documents and schedules for Revision Cycles may change. Please check the NFPA Website for the most up-to-date information on Public Input Closing Dates and schedules at www.nfpa.org/document # (i.e. www.nfpa.org/101) and click on the Next Edition tab*

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Change Design Scheme "A" to Design Scheme "X".

Too many people are confusing Design Scheme "A" in section 16.6.1 with Layout A from Section 16.5.1.10. It is resulting in incorrect sprinkler system arrangements.
Submitter: Kenneth E. Isman, National Fire Sprinkler Association, Inc.

Recommendation: Change Design Scheme "B" to Design Scheme "Y".

Substantiation: Too many people are confusing Design Scheme "B" in section 16.6.2 with Layout B from Section 16.5.1.10. It is resulting in incorrect sprinkler system arrangements.
Change Design Scheme "C" to Design Scheme "Z".
Too many people are confusing Design Scheme "C" in section 16.6.3 with Layout C from Section 16.5.1.10. It is resulting in incorrect sprinkler system arrangements.
The point of the global change is to add low pressure cylinders to the list of flammable liquid containers. This appears multiple times in NFPA 30, making it applicable for a global change.

Change "containers, portable tanks, and intermediate bulk containers" to "containers, low pressure cylinders, portable tanks, and intermediate bulk containers"

Flammable and combustible liquids contained in a cylinder designed per DOT regulations and relief devices designed per CGA regulations at low internal working pressures (<260 psi @77F) exhibit fire hazards at high temperatures that are no greater than currently accepted receptacles that contain flammable liquids or portable tanks.

The US DOT PHMSA Table of Hazardous Materials will be updated 2012 in HM215L to recognize 6 new UN#s, 3500-3505, and Proper Shipping names which more accurately reflect the chemical states and hazards of incompressible liquids being expelled by pressurized gases. An example is UN 3501, "Chemical Under Pressure, Flammable, N.o.s.”

We believe that existing NFPA 30 language will need to be created or altered to recognize Flammable liquids placed into low pressure cylinders and used for spray applications.

Science and test data have shown that under fire conditions flammable liquids in well designed cylinders under low pressure can be safely stored under the same code as Flammable liquids.

A well designed cylinder is constructed and certified to Dept of Transportation (DOT) standards and has pressure relief devices installed to Compressed Gas Association (CGA) standards.

Testing has shown that a cylinder constructed to DOT 39 and DOT4BW240 has walls and welded seams that can withstand an internal pressure increase until the relief devices open to lower the pressure. By standards this is at a minimum of four times the working pressure. This is would be two times the pressure under fire conditions. This is a very adequate safety margin.

Testing has shown that the two styles of relief devices (frangible disk and spring loaded valve) installed per CGA specification open at a minimum of four times the working pressure and two times pressure under actual fire conditions. This is a very adequate safety margin.

Testing has shown that the relief device orifice per CGA regulations are wide to allow internal pressure to vent at a high enough rate in CFM (cubic feet per minute) to prevent any pressure increase past the designated relief pressure limit. The cylinder seams will not burst because the relief device is adequately sized.

Testing has shown that the volume of flammable vapor expelled through the relief device does not dislocate the cylinder. Relief valve discharges do not dangerously “rocket” the cylinder as can happen with unchained high pressure cylinders (3,000 psi).

Science has shown that the product formulations in the cylinder cannot autoignite or create a boiling liquid expanding vapor explosion (BLEVE).
<table>
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</tbody>
</table>

**Submitter:** Michael Jacobs, 3M  
**Recommendation:** Revise text to read:  
(1) Containers, intermediate bulk containers, low pressure cylinders, and portable tanks that are used in operations areas, as covered by Chapter 17.  
**Substantiation:** Adding low pressure cylinders.
<table>
<thead>
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<th>30-</th>
<th>Log #38 FLC-SWC</th>
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<td>(9.1.4(3) and (4))</td>
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</tbody>
</table>

**Submitter:** John A. LeBlanc, FM Global

**Recommendation:** Delete the following text and renumber the remaining subsections:

(3) Beverages where packaged in individual containers that do not exceed 1.3 gal (5 L) capacity

(4) Medicines, foodstuffs, cosmetics, and other consumer products that contain not more than 50 percent by volume of water-miscible flammable or combustible liquids, with the remainder of the product consisting of components that do not burn and where packaged in individual containers that do not exceed 1.3 gal (5 L) capacity

**Substantiation:** Full scale fire testing on 50% IPA / 50% water mixtures in 1 gal plastic bottles by FM Global has clearly shown that this mixture-container combination creates a significant fire hazard that would fall within the scope of NFPA 30. These mixtures are covered by Figure 16.4.1(c) in the current code. The fact that the final product is a beverage or some other type of consumer product does not change the overall fire hazard created. The current exclusions will in fact create a false sense of security in the mind of anyone using the code which is unjustified.
Where containers, intermediate bulk containers, low pressure cylinders, or portable tanks are stacked, they shall be stacked so that stability is maintained and excessive stress on container walls is prevented.

Substantiation: Adding low pressure cylinders.
9.3.9.1 Portable tanks, low pressure cylinders, and intermediate bulk containers stored more than one high shall be designed to stack securely, without the use of dunnage.

Substantiation: Adding low pressure cylinders.
Submitter: Michael Jacobs, 3M

Recommendation: Revise text to read:

9.3.9.2 Materials-handling equipment shall be capable of handling containers, portable tanks, **low pressure cylinders**, and intermediate bulk containers that are stored at all storage levels.

Substantiation: Adding low pressure cylinders.
Submitter: Michael Jacobs, 3M

Recommendation: Revise text to read:

9.3.10 Containers, low pressure cylinders, intermediate bulk containers, and portable tanks in unprotected liquid storage areas shall not be stored closer than 36 in. (915 mm) to the nearest beam, chord, girder, or other roof or ceiling member.

Substantiation: Adding low pressure cylinders.
Each portable tank or low pressure cylinder, or intermediate bulk container shall be provided with one or more devices installed in the top with sufficient emergency venting capacity to limit internal pressure under fire exposure conditions to a gauge pressure of 10 psi (70 kPa) or 30 percent of the bursting pressure of the portable tank, whichever is greater.

**Recommendation:** Revise text to read:

Each portable tank or low pressure cylinder, or intermediate bulk container shall be provided with one or more devices installed in the top with sufficient emergency venting capacity to limit internal pressure under fire exposure conditions to a gauge pressure of 10 psi (70 kPa) or 30 percent of the bursting pressure of the portable tank, whichever is greater.

**Substantiation:** Adding low pressure cylinders and changing wording slightly to fit with added specifications.
Submitter: Michael Jacobs, 3M

Recommendation: Revise text including the Table title to read:

The maximum allowable size of a container, low pressure cylinder, intermediate bulk container, or metal portable tank for Class I, Class II, and Class IIIA liquids shall not exceed that specified in Table 9.4.3.

Table 9.4.3 Maximum Allowable Size — Containers, Low Pressure Cylinders, Intermediate Bulk Containers (IBCs), and Portable Tanks

Substantiation: Added low pressure cylinders.
For ambulatory health care, day care, educational, and health care occupancies, the MAQ for Class IIIB liquids shall be permitted to be increased 100 percent if the building is protected throughout with an automatic sprinkler system installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, or an automatic water mist system in accordance with NFPA 750, *Standard on Water Mist Fire Protection Systems*.

**Substantiation:** Add a reference to NFPA 750 Standard on Water Mist Fire Protection Systems. Water Mist systems have been approved and installed in many sprinkler applications globally for over 15 years. They have been listed by national and internationally recognized testing laboratories such as: UL (Ordinary Hazard Group 1), FM (Light Hazard occupancies, Computer Rooms, Subfloors, Special Hazard Machinery & spaces), City of New York (Light Hazard Occupancies, Combustion Turbines, Machinery Spaces), VdS Germany (Light Hazard, Ord Haz Grp I,II parking garages & III selected occupancies, Cable Tunnels), KfV Austria (Light Hazard, Ord Haz Grp I, Combustion Turbines) and other agencies. These listings and installations have demonstrated equivalent fire protection to the authority having jurisdiction (AHJ). The addition of the proposed text will provide the AHJ a clear option to accept water mist systems as an equivalent system to an approved automatic sprinkler system thereby allowing construction alternatives without having to prove equivalency or be considered an alternative extinguishing system.
Exception: An acceptable alternative is at least one portable fire extinguisher having a capacity of 80:B located within 50 ft (15 m) of such a storage area.

(3) At least one portable dry chemical fire extinguisher having a minimum 40B rating and minimum discharge rate of 1 lb/sec (0.45 kg/sec) shall be located within 50 ft (15 m) of liquid storage areas.

Substantiation: This revision addresses NFPA manual of style requirements for not having exceptions and further helps clarify existing NFPA-10 fire extinguisher selection recommendations for properly addressing specific Class B hazards such as potential obstacle and gravity three-dimensional fire situations. Back in 2007, the NFPA-10 committee revised extinguisher selection recommendations for fire extinguishers addressing special Class B fire hazard situations. (Reference current 2010 edition of NFPA-10 Section 5.5)

Extinguishers models having higher agent flow rates have historically always addressed these types of fire situations better than similar extinguisher models with higher numerical class B fire ratings, which in contrast require and dictate extended discharge duration times. Current NFPA-10 fire extinguisher recommendations for such hazards are based upon dry chemical models having minimum agent capacities of 10 pounds and agent discharge flow rates of 1 lb/sec (0.45 kg/sec) or greater. The high-flow 10 and 20 pound types of fire extinguisher models typically also carry reduced numerical Class B fire ratings of only 20B and 40B respectively. For this reason, the existing NFPA-30 standards 80 B:C rating reference needs to be removed or reduced accordingly.

Believe the proposed new paragraph 9.10.2.2(3) maintains the committee’s desired fire protection coverage objectives and existing maximum 50 ft extinguisher travel distance recommendation for properly addressing liquid storage areas.
9.12.1 Electrical area classification shall not be required for liquid storage areas where all containers, low pressure cylinders, intermediate bulk containers, and portable tanks are sealed and are not opened, except as provided for in 9.12.2.

Substantiation: Adding low pressure cylinders.
Recommendation: Delete the following text and renumber the remaining subsections:

(3) Beverages where packaged in individual containers that do not exceed 1.3 gal (5 L) capacity

(4) Medicines, foodstuffs, cosmetics, and other consumer products that contain not more than 50 percent by volume of water-miscible flammable or combustible liquids, with the remainder of the product consisting of components that do not burn and where packaged in individual containers that do not exceed 1.3 gal (5 L) capacity

Substantiation: Full scale fire testing on 50% IPA / 50% water mixtures in 1 gal plastic bottles by FM Global has clearly shown that this mixture-container combination creates a significant fire hazard that would fall within the scope of NFPA 30. These mixtures are covered by Figure 16.4.1(c) in the current code. The fact that the final product is a beverage or some other type of consumer product does not change the overall fire hazard created. The current exclusions will in fact create a false sense of security in the mind of anyone using the code which is unjustified.
Add a new footnote to Table 10.7.1 to read:

For storage heights that do not exceed 4 ft for Class I liquids, 6 ft for Class II liquids and 8 ft for Class III liquids.

The addition of footnote d for a nonsprinklered building a height restriction is incorporated. As written the current provisions of Table 10.7.1 do not limit the storage height for a nonsprinklered building while those within a sprinklered building are limited. An allowance for a nonsprinklered building to have a greater allowable storage height than a sprinklered building is counterintuitive. The indicated allowable storage heights for a nonsprinklered building match those prescribed by the International Fire Code.
Class II liquids that are not water-miscible and are packaged in plastic containers of 1 gal (3.8 L) capacity or greater shall be limited as follows:

Substantiation: The provisions of this Section only regulate non water-miscible Class II liquids in plastic containers. As a more volatile liquid non water-miscible Class I liquids should not be excluded from this Section.
30- Log #49  FLC-SWC
(10.14.1 (New) )

Submitter: Tracey D. Bellamy, Telgian Corporation
Recommendation: Add a new section to read:
10.14.1 Ventilation shall not be required for dispensing of quantities that do not exceed 16 oz (0.5 L) including, but not limited to, tinting of paints and coatings.
Substantiation: A similar allowance for dispensing of small quantities of liquids should be provided for exclusion from ventilation as was included for electrical classification areas as provided in Section 10.12.3.
### 12.3.5

Protected and unprotected solid pile and palletized storage shall be provided with aisles that are arranged so that no container, portable tank, low pressure cylinder, or intermediate bulk container is more than 20 ft (6 m) from an aisle.

**Substantiation:** Add low pressure cylinder.

**Recommendation:** Revise text to read:
30- Log #87 FLC-SWC (Table 12.6.2.2)

Submitter: Michael Jacobs, 3M
Recommendation: Revise Table to read:

INSERT 30_L87 (PI #79) Rec HERE

Substantiation: Adding low pressure cylinders.
12.8.1* Class IB and IC liquids in containers of 1.3 gal (5 L) or less capacity, Class II liquids in containers of 5.3 gal (20 L) or less capacity, Class IIIA liquids in containers of 60 gal (230 L) or less capacity, and Class IIIB liquids in containers, intermediate bulk containers, low pressure cylinders, or portable tanks of 275 gal (1040 L) or less capacity shall be permitted to be stored in warehouses that handle combustible commodities, as defined in NFPA 13, *Standard for the Installation of Sprinkler Systems*, provided that the storage area for liquids is protected with automatic sprinklers in accordance with either of the following:

**Substantiation:** Adding low pressure cylinders.
30- Log #90 FLC-SWC
(13.1(f))

Submitter: Michael Jacobs, 3M

Recommendation: Revise text to read:
(1) Drums or, low pressure cylinders, or other containers that do not exceed 119 gal (450 L) individual capacity

Substantiation: Adding low pressure cylinders.
13.3.8 Containers, intermediate bulk containers, low pressure cylinders, and portable tanks shall not be stored closer than 36 in. (915 mm) to the nearest beam, chord, girder, or other roof member.

Substantiation: Adding low pressure cylinders.
(1) Containers and low pressure cylinders that do not exceed 119 gal (450 L) individual capacity

Substantiation: Adding low pressure cylinders.
(1) Drums or low pressure cylinders, or other containers that do not exceed 119 gal (450 L) individual capacity

Substantiation: Adding low pressure cylinders.
Outdoor storage of liquids in containers, intermediate bulk containers, low pressure cylinders, and portable tanks shall comply with Table 15.3 and with all applicable requirements of this chapter.

Substantiation: Adding low pressure cylinders.
30- Log #95 FLC-SWC
(15.3.2)

Submitter: Michael Jacobs, 3M

Recommendation: Revise text to read:
15.3.2 No container, intermediate bulk container, low pressure cylinders, or portable tank in a pile shall be more than 200 ft (60 m) from a minimum 20 ft (6 m) wide access way to permit approach of fire control apparatus under all weather conditions.

Substantiation: Adding low pressure cylinders.
30- Log #96  FLC-SWC
(15.4.1) Final Action:

Submitter: Michael Jacobs, 3M

Recommendation:  Revise text to read:

15.4.1 A maximum of 1100 gal (4160 L) of liquids in containers, intermediate bulk containers, low pressure cylinders, or portable tanks shall be permitted to be stored adjacent to a building under the same management, provided the following conditions apply:

Substantiation: Adding low pressure cylinders.
30- Log #97 FLC-SWC
(16.1.1)

Submitter: Michael Jacobs, 3M

Recommendation: Revise text to read:
16.1.1* This chapter shall apply to automatic fire protection systems for all inside storage of flammable and combustible liquids in containers, intermediate bulk containers, low pressure cylinders, and portable tanks as specified in Section 9.4.

Substantiation: Adding low pressure cylinders.
30- Log #98 FLC-SWC

Final Action:

Submitter: Michael Jacobs, 3M
Recommendation: Revise text to read:
16.2.3* Relieving-Style Container.

A metal container, a metal intermediate bulk container, low pressure cylinder, or a metal portable tank that is equipped with at least one pressure-relieving mechanism at its top that is designed, sized, and arranged to relieve the internal pressure generated due to exposure to fire so that violent rupture is prevented.

Substantiation: Adding low pressure cylinders.
(3) The requirements of 16.3.1 (2) (a) shall not apply to the extension of the design criteria from an upper level ceiling to beneath a lower ceiling level where the difference in height between the ceiling levels is at least 2 ft (0.6 m).

The inclusion of the new material will clarify that the extension of the sprinkler design criteria for the flammable/combustible liquid protection need not extend to lower adjacent ceiling areas (such as mezzanine structures) the same as would be required at the ceiling level. This allowance matches that included within NFPA 13, Section 12.3 (3).
Submitter: Tracey D. Bellamy, Telgian Corporation

Recommendation: Revise text to read:

(2) Criteria for cartoned unexpanded Group A plastics in accordance with Figure 16.4.1(b) NFPA 13

Substantiation: The inclusion of the specific type of Group A Plastic is needed for a complete identification of the criteria required in NFPA 13. A direct reference to NFPA 13 rather than through Figure 16.4.1(a) is cleaner and avoids confusion on the application.
16.4.1.1   Figure 16.4.1(a) shall be used for miscible and nonmiscible flammable and combustible liquids in metal containers, metal portable tanks, low pressure cylinders, and metal intermediate bulk containers.

Substantiation:  Adding low pressure cylinders.
30- Log #100 FLC-SWC
(16.4.1.2)

Submitter: Michael Jacobs, 3M

Recommendation: Revise text to read:

16.4.1.2 Figure 16.4.1(b) shall be used for miscible and nonmiscible flammable and combustible liquids in nonmetallic containers, and nonmetallic intermediate bulk containers, and low pressure cylinders.

Substantiation: Adding low pressure cylinders.
Submitter: Michael Jacobs, 3M

Recommendation: Revise text to read:

16.4.1.3 Figure 16.4.1(c) shall be used for water-miscible flammable and combustible liquids in nonmetallic containers and in nonmetallic intermediate bulk containers, and low pressure cylinders.

Substantiation: Adding low pressure cylinders.
Submitter: Tracey D. Bellamy, Telgian Corporation
Recommendation: Revise Figures as follows:

INSERT 30_L52 (PI #42) Rec Figure 16.4.1(b) HERE

INSERT 30_L52 (PI #42) Rec Figure 16.4.1(c) HERE

Substantiation: The inclusion of the specific type of Group A Plastic is needed for determination of the required protection in NFPA 13.
FIGURE 16.4.1(b) Fire Protection Criteria Decision Tree for Miscible and Nonmiscible Flammable and Combustible Liquids in Nonmetallic Containers.
FIGURE 16.4.1(c) Fire Protection Criteria Decision Tree for Miscible Flammable and Combustible Liquids in Nonmetallic Containers.
Add a new section to read:

16.5.1.1.1 The protection criteria in Tables 16.5.2.1 through 16.5.2.12 shall only be used with ceilings having a pitch of 2 in 12 or less.

**Substantiation:** All of the fire tests that have been performed to develop the sprinkler criteria in NFPA 30 have been done under horizontal ceilings. Experience has shown that in situations where the slope exceeds 2 in 12, sprinklers up the slope and remote from the fire can activate first, skewing the design area and pulling critical water from the water supply, without having an effect on the fire. At the same time, the hot gasses moving up the slope and away from the sprinklers directly over the fire causes a delay in activating sprinklers directly over the fire. This delay calls into question the ability of the discharge densities to actually control the fire once the sprinklers open because flammable and combustible liquids fires have such fast growth rates.

Without a section such as this in the standard, people think that they can just use the criteria from NFPA 30 and then apply a 30% increase to the design area as referenced by NFPA 13 section 11.2.3.2.4. But this section of NFPA 13 was not intended to be used to protect flammable or combustible liquid fires and there is no evidence that a 30% increase to the design area and no increase to the density is sufficient protection for the commodities and storage arrangements handled by the tables in NFPA 30.
16.5.1.5 The ceiling heights given in Table 16.5.2.1 through Table 16.5.2.12 shall, excluding Table 16.5.2.8 shall be permitted to be increased by a maximum of 10 percent if an equivalent percent increase in ceiling sprinkler design density is provided.

Substantiation: The allowance for a 10% increase in density would not apply to ESFR sprinklers covered by Table 16.8.2.8 as these sprinklers do not use a density design criteria.
(4) SR = standard response sprinkler; QR = quick response sprinkler; ESFR = early suppression fast response sprinkler; OT = ordinary temperature or intermediate temperature; HT = high temperature

Substantiation: The installation of intermediate temperature sprinklers are required when temperatures exceed 100F and an allowance in needed for such applications. This matches the allowance provided by NFPA 13, Section 12.6.8.1.
16.5.1.10 For the purposes of Section 16.5, the following shall apply to the in-rack sprinkler design layouts specified in Table 16.5.2.1 through Table 16.5.2.12:

(1) Layout A shall mean one line of in-rack sprinklers 8 ft (2.4 m) above the floor in the longitudinal flue space, with sprinklers spaced not more than 10 ft (3 m) on center. Sprinklers shall be staggered vertically.

(2) Layout B shall mean one line of in-rack sprinklers 6 ft (1.8 m) above the floor and one line of in-rack sprinklers 12 ft (3.6 m) above the floor in the longitudinal flue space, with sprinklers spaced not more than 10 ft (3 m) on center. Sprinklers shall be staggered vertically.

(3) Layout C shall mean one line of in-rack sprinklers in the longitudinal flue space at every storage level above the floor except above the top tier, with sprinklers spaced not more than 10 ft (3 m) on center. Sprinklers shall be staggered vertically where more than one level of in-rack sprinklers are installed.

(4) Layout D shall mean one line of in-rack sprinklers in the longitudinal flue space at every other storage level except above the top tier, beginning above the first storage level, with sprinklers spaced not more than 10 ft (3 m) on center. Sprinklers shall be staggered vertically where more than one level of in-rack sprinklers are installed.

(5) Layout E shall mean one line of in-rack sprinklers in the longitudinal flue space at every storage level above the floor and except above the top tier and face sprinklers at the first storage level at each rack upright. In-rack sprinklers shall be spaced not more than 9 ft (2.7 m) on center and shall be staggered vertically where more than one level of in-rack sprinklers are installed.

(6) Layout F shall mean one line of in-rack sprinklers in the longitudinal flue space at every other storage level above the first storage level except above the top tier and face sprinklers at the first storage level at each rack upright. In-rack sprinklers shall be spaced not more than 10 ft (3 m) on center and shall be staggered vertically where more than one level of in-rack sprinklers are installed.

Substantiation: Clarifying language to identify the specific location of the required in-rack sprinklers.
30- Log #31 FLC-SWC
(16.5.1.10(1))

Submitter: Kenneth E. Isman, National Fire Sprinkler Association, Inc.

Recommendation: Revise text to read:
(1) Layout A shall mean one line of in-rack sprinklers 8 ft (2.4 m) above the floor, with sprinklers spaced not more than 10 ft (3 m) on center. Sprinklers shall be staggered vertically.

Substantiation: You cannot stagger one line of sprinklers vertically. There is no other line of sprinklers to stagger with.
30- Log #32  FLC-SWC  
(Table 16.5.2.1)

Submitter: Kenneth E. Isman, National Fire Sprinkler Association, Inc.
Recommendation: Revise Table to read as follows:

INSERT 30_L32 (PI #107) Rec Table 16.5.2.1

Substantiation: Users do not know what the "Layout" means and where to find it. They are mixing up the "Layout" with the "Design Scheme" because the Design Scheme is a layout of in-rack sprinklers, which is what the Layout column is trying to describe. The simple addition of a reference to the section where the layout is described is tremendously helpful.
Submitter: Kenneth E. Isman, National Fire Sprinkler Association, Inc.

Recommendation: Revise the Note (1) of the Table to read:

Notes:

(1) In-rack sprinkler design shall be based on 6 most hydraulically remote sprinklers in each of upper three levels or on 8 most hydraulically remote sprinklers, if only one level the following:

   (a) Where one level of in-rack sprinklers is installed, the design shall include the 8 most hydraulically remote sprinklers.

   (b) Where two levels of in-rack sprinklers is installed, the design shall include the 6 most hydraulically remote sprinklers on each level.

   (c) Where three or more levels of in-rack sprinklers are installed, the design shall include the 6 most hydraulically remote sprinklers on the top three levels.

Substantiation: There is currently no information on how to deal with two levels of in-rack sprinklers. The instructions only cover one level and three or more levels.
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30- Log #56 FLC-SWC
(Table 16.5.2.1, Notes)

Submitter: Tracey D. Bellamy, Telgian Corporation
Recommendation: Revise the Notes to the Table to read:


Notes:
(1) In-rack sprinkler design based on 6 most hydraulically remote sprinklers in each of upper three levels or on 8 most hydraulically remote sprinklers, if only one level.
(2) Protection for uncartoned or case-cut nonsolid shelf display up to 6.5 ft. (2 m) and storage above in pallets on pallets in racking, and stored on shelf materials, including, open wire mesh, or 2 in. × 6 in. (50 mm × 150 mm) wooden slats, spaced a minimum of 2 in. (50 mm) apart.
(3) For K=8.0 and larger ceiling sprinklers, increase ceiling density to 0.60 if more than one level of storage exists above the top level of in-rack sprinklers.
(4) Double-row racks limited to maximum 6 ft (1.8 m) width.
(5) For K=8.0 and larger ceiling sprinklers, increase ceiling density to 0.60 over 2000 ft² if more than one level of storage exists above the top level of in-rack sprinklers.
(6) Reduce in-rack sprinkler spacing to maximum 9 ft (2.7 m) centers.
(7) The minimum in-rack discharge pressure shall not be less than 10 psi.

Substantiation: The type of sprinkler abbreviations are already covered by 16.5.1.9 (4).
A change is proposed to the in-rack sprinkler type to allow for larger orifice sprinklers based on improved performance of larger orifice sprinklers in providing fire control with a minimum operating pressure threshold of 10 psi as a new Note 7.

Note 2 is editorially corrected to make the language flow correctly.
Notes 3 and 5 have been revised to eliminate the K=8.0 or larger assessment as the ceiling sprinkler will always be K8.0 or larger based on the requirements of each row entry within the Table.
| Submitter: | Michael Jacobs, 3M |
| **Recommendation:** | Revise text and the title to Table 16.5.2.1 to read: |
| (4) Metal containers, low pressure cylinders, metal portable tanks, metal intermediate bulk containers |
| **Table 16.5.2.1 Design Criteria for Sprinkler Protection of Single- and Double-Row Rack Storage of Liquids in Metal Containers, Low Pressure Cylinders, Portable Tanks, and IBCs** |
| **Substantiation:** | Adding low pressure cylinders. |
30- Log #62 FLC-SWC  
(Table 16.5.2.2, Notes)  

Final Action:  

Submitter: Tracey D. Bellamy, Telgian Corporation  
Recommendation: Delete the following Note in the Table:  
Substantiation: The type of sprinkler abbreviations are already covered by 16.5.1.9 (4).
Recommendation: Revise text and the title to Table 16.5.2.2 to read:

(4) Metal containers, low pressure cylinders, metal portable tanks, metal intermediate bulk containers

Table 16.5.2.2 Design Criteria for Sprinkler Protection of Palletized and Stacked Storage of Liquids in Metal Containers, Low Pressure Cylinders, Portable Tanks, and IBCs

Substantiation: Adding low pressure cylinders.
Kenneth E. Isman, National Fire Sprinkler Association, Inc.

Recommendation: Revise Table to read as follows:

INSERT 30_L32 (PI #107) Rec Table 16.5.2.3

Substantiation: Users do not know what the "Layout" means and where to find it. They are mixing up the "Layout" with the "Design Scheme" because the Design Scheme is a layout of in-rack sprinklers, which is what the Layout column is trying to describe. The simple addition of a reference to the section where the layout is described is tremendously helpful.
30- Log #57  FLC-SWC  
(Table 16.5.2.3)  

Submitter: Tracey D. Bellamy, Telgian Corporation  
Recommendation: Revise the table as follows:

INSERT 30_L57 (PI #52) Rec  

Substantiation: The type of sprinkler abbreviations are already covered by 16.5.1.9 (4). The allowable type of in-rack sprinkler has been extended to allow larger orifice sprinklers based on improved performance of larger orifice sprinkler. A minimum design pressure of 10 psi has been added.
Michael Jacobs, 3M

Recommendation: Revise text and the title to Table 16.5.2.3 to read:
(4) Metal containers, low pressure cylinders, metal portable tanks, metal intermediate bulk containers

Table 16.5.2.3 Design Criteria for Foam-Water Sprinkler Protection of Single- or Double-Row Rack Storage of Liquids in Metal Containers, Low Pressure Cylinders, Portable Tanks, and IBCs

Substantiation: Adding low pressure cylinders.
Rory Goff, Red Iron Consultant

**Recommendation:** In Table 16.5.2.5 delete the term "width" in the column that reads:

<table>
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<th>Rack</th>
<th>Width</th>
<th>Depth</th>
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**Substantiation:** The problem is that incorrect usage of a word brings confusion to the literal minded. The word WIDTH is used incorrectly. In the document NFPA 30, it refers to the distance between the front of the rack (where you load the product) and the back. That is actually DEPTH. WIDTH should refer to the distance from one END to the other END. Aisles are referred to correctly in terms of WIDTH since the front of the Aisle is the short side. The rack front is the long side, the WIDTH, the short side is what you wish to control and that is the DEPTH.
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**Submitter:** Tracey D. Bellamy, Telgian Corporation  
**Recommendation:** Revise the table as follows:

INSERT 30_L63 (PI #58) Rec

**Substantiation:** The type of sprinkler abbreviations are already covered by 16.5.1.9 (4).
30- Log #105  FLC-SWC (16.5.2.4(4))

Submitter: Michael Jacobs, 3M

Recommendation: Revise text and the title to Table 16.5.2.4 to read:
(4) Metal containers, low pressure cylinders, metal portable tanks, metal intermediate bulk containers

Table 16.5.2.4 Design Criteria for Foam-Water Sprinkler Protection of Palletized and Stacked Storage of Liquids in Metal Containers, Low Pressure Cylinders, Portable Tanks, and IBCs

Substantiation: Adding low pressure cylinders.
30- Log #58 FLC-SWC (Table 16.5.2.6)

Submitter: Tracey D. Bellamy, Telgian Corporation
Recommendation: Revise the table as follows:

INSERT 30_L58 (PI #53) Rec

Substantiation: The type of sprinkler abbreviations are already covered by 16.5.1.9 (4). Test S47 utilized both nonrelieving style and relieving style containers and the Table should reflect such by allowing both. The tested aisle width in Test S47 was 5 ft and should be included as a requirement of the Table.
Test S47 utilized K5.6 sprinkler as part of the tested arrangement and should be reflected in the Table.
<table>
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**Submitter:** Kenneth E. Isman, National Fire Sprinkler Association, Inc.

**Recommendation:** Revise Table to read as follows:

INSERT 30_L35 (PI #109) Rec Table 16.5.2.8

**Substantiation:** Users do not know what the "Layout" means and where to find it. They are mixing up the "Layout" with the "Design Scheme" because the Design Scheme is a layout of in-rack sprinklers, which is what the Layout column is trying to describe. The simple addition of a reference to the section where the layout is described and the section where the in-rack sprinklers are graphically shown is tremendously helpful.
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### Submitter
Tracey D. Bellamy, Telgian Corporation

### Recommendation
Revise the table as follows:

- INSERT 30_L59 (PI #54) Rec

### Substantiation
The type of sprinkler abbreviations are already covered by 16.5.1.9 (4).

A temperature rating is needed for the top two rows of entries within the Table. The proposal inserts an allowance for larger orifice in-rack sprinklers and changes the discharge criteria to a flow rate with a minimum operating pressure of 10 psi based on the improved performance of larger orifice sprinklers.
<table>
<thead>
<tr>
<th>Log #60 FLC-SWC (Table 16.5.2.9)</th>
<th>Final Action:</th>
</tr>
</thead>
</table>

**Submitter:** Tracey D. Bellamy, Telgian Corporation  
**Recommendation:** Revise the table as follows:

INSERT 30_L60 (PI #55) Rec

**Substantiation:** The type of sprinkler abbreviations are already covered by 16.5.1.9 (4).  
A reference to E.1 is not needed.
Revise Note 2 of the Table to read:

(2) Rigid nonmetallic intermediate bulk containers shall be listed and labeled in accordance with UL 2368, Standard for Fire Exposure Testing of Intermediate Bulk Containers for Flammable and Combustible Liquids, FM Class 6020, Approval Standard for Intermediate Bulk Containers or an equivalent test procedure.

Substantiation: FM Approvals now has a published standard for evaluating the fire resistance of IBCs. It is at least equivalent to the UL method and should be recognized as an option.
<table>
<thead>
<tr>
<th>30-</th>
<th>Log #61 FLC-SWC (Table 16.5.2.10)</th>
<th>Final Action:</th>
</tr>
</thead>
</table>

**Submitter:** Tracey D. Bellamy, Telgian Corporation  
**Recommendation:** Revise the table as follows:

INSERT 30_L61 (PI #56) Rec

**Substantiation:** I reference to E.1 is not needed.
30- Log #64  FLC-SWC
(Table 16.5.2.11, Notes)

**Final Action:**

**Submitter:** Tracey D. Bellamy, Telgian Corporation

**Recommendation:** Delete the following Note in the Table:


**Substantiation:** The type of sprinkler abbreviations are already covered by 16.5.1.9 (4).
Tracey D. Bellamy, Telgian Corporation

Recommendation: Delete the following Note in the Table:

Substantiation: The type of sprinkler abbreviations are already covered by 16.5.1.9 (4).
30- Log #66 FLC-SWC (16.6.1.4(1) and (3))

Submitter: Tracey D. Bellamy, Telgian Corporation

Reviside text to read:

(1) In-rack sprinklers shall be nominal K=8.0, ordinary or intermediate temperature–rated quick-response sprinklers.

(3) In-rack sprinklers shall provide a minimum end operating pressure (gauge pressure) of 50 psi (345 kPa) out of the hydraulically most remote six sprinklers (three on two lines), if one barrier level is provided, or the hydraulically most remote eight sprinklers (four on two lines), if two or more barrier levels are provided.

Substantiation: The proposal introduces an allowance for larger orifice in-rack sprinklers with an equivalent flow to that prescribed by the current 50 psi operating pressure on a K8.0 sprinkler and provides for the use of intermediate temperature sprinklers for such ambient temperature conditions as might be encountered in an unconditioned warehouses.
Ceiling sprinkler protection shall provide a minimum density of 0.3 gpm/ft$^2$ over the most hydraulically remote 2000 ft$^2$ (12 mm/min over 180 m$^2$) using ordinary or intermediate temperature, standard-response sprinklers with a nominal K-factor equal to or greater than 8.0.

Substantiation: The proposal provides for the use of intermediate temperature sprinklers for such ambient temperature conditions as might be encountered in an unconditioned warehouses.
30- Log #67  FLC-SWC
(16.6.2.4(1), (3), and (4))

Submitter: Tracey D. Bellamy, Telgian Corporation

Recommended: Revise text to read:

(1) In-rack sprinklers shall be nominal K≥8.0, ordinary or intermediate temperature-rated quick-response sprinklers.

(3) For containers that do not exceed 60 gal (230 L) capacity and where there is only one horizontal barrier, in-rack sprinklers shall provide a minimum end operating pressure (gauge pressure) of 50 psi (345 kPa) minimum operating flow of 57 gpm out of the hydraulically most remote six sprinklers (three on two lines), if one barrier level is provided, or the hydraulically most remote eight sprinklers (four on two lines), if two or more barrier levels are provided.

(4) For containers that exceed 60 gal (230 L) capacity, but do not exceed 793 gal (3000 L), in-rack sprinklers shall provide a minimum operating pressure (gauge pressure) of 50 psi (345 kPa) flow of 57 gpm from the hydraulically most remote 12 sprinklers, six each on two lines.

Substantiation: The proposal introduces an allowance for larger orifice in-rack sprinklers with an equivalent flow to that prescribed by the current 50 psi operating pressure on a K8.0 sprinkler and provides for the use of intermediate temperature sprinklers for such ambient temperature conditions as might be encountered in an unconditioned warehouses.
30- Log #68  FLC-SWC  Final Action:  
(16.6.3.3(1) and (3))

Submitter: Tracey D. Bellamy, Telgian Corporation

Recommendation: Revise text to read:

(1) In-rack sprinklers shall be nominal K\geq8.0, ordinary temperature-rated or intermediate temperature-rated, quick-response sprinklers.

(3) In-rack sprinklers shall provide a minimum end operating pressure (gauge pressure) of 14 psi (97 kPa) flow of 30 gpm out of the hydraulically most remote six sprinklers (three on two lines), if one barrier level is provided, or the hydraulically most remote eight sprinklers (four on two lines), if two or more barrier levels are provided.

Substantiation: The proposal introduces an allowance for larger orifice in-rack sprinklers with an equivalent flow to that prescribed by the current 14 psi operating pressure on a K8.0 sprinkler and provides for the use of intermediate temperature sprinklers for such ambient temperature conditions as might be encountered in an unconditioned warehouses.
16.6.4 In-Rack Sprinkler Layouts for Table 16.5.2.8: G through I. Where indicated in Table 16.5.2.8, in-rack sprinklers shall be installed as follows:

1. Where Layout G is required, in accordance with Figure 16.6.4(a).
2. Where Layout H is required, in-rack sprinklers shall be installed in accordance with Figure 16.6.4(d), or Figure 16.6.4(e).
3. Where Layout I is required, in-rack sprinklers shall be installed in accordance with Figure 16.6.4(b), or Figure 16.6.4(c), whichever is applicable.

The user needs help in selecting the correct figure to determine the in-rack sprinkler placement. The situation is made worse by the fact that you don't configure your Figures in numerical order. The layouts go G, H and I. But the order of the figures that go with them are a, d, e, b, c.

Note that I typed this public input straight into the computer so that it looked very nice, but the NFPA system jumbled the proposed text when it forced it into legislative text. I don't know how to fix that, but it is frustrating that I cannot provide a clean version of the proposed text to the committee.
A.16.1.1 See Annex E for limitations of the protection criteria of Table 16.5.2.1 through Table 16.5.2.12, particularly for intermediate bulk containers and low pressure cylinders, and portable tanks having capacities greater than 60 gal (230 L).

Protected storage allowed under previous editions of this code can be continued if the class of liquids stored, the quantity of liquids stored, fire protection, and building configuration remain unchanged. Table A.16.1.1(a) and Table A.16.1.1(b), reprinted here from the 1993 edition of this code, can be used as a reference for storage arrangements in previously approved, protected, inside liquid storage areas.

For certain liquids such as ketones, esters, and alcohols, the minimum required densities established in the listing criteria for foam discharge devices are often higher than the general densities specified for protection of flammable and combustible liquids. When determining the design criteria for extinguishing systems using foam, it is important to ensure that the listing criteria, which are typically based on empirical data from fire tests, are not overlooked. Otherwise, the fire protection system design can be inadequate for proper protection.

Early suppression fast-response (ESFR) sprinklers have been tested for protection of liquids only to the extent reflected in the tables in Section 16.5. Any other use of ESFR sprinklers for protection of liquids should be based on an engineering analysis that evaluates the potential failure of the sprinkler system based on a rapid-growth fire or a large pool fire that would operate more sprinklers than are accommodated by the design area. The use of ESFR protection, particularly without provisions for the control of spread of liquid, presents the possibility of a liquid pool fire that could exceed the limited design operating area of an ESFR system.

The information in Table 16.5.2.1 through Table 16.5.2.12 was developed from full-scale fire tests. Where only one K-factor sprinkler is allowed, this was the only size proven to provide fire control. Where a choice of K-factors is allowed by the tables, each was able to provide fire control; however, the larger K-factor sprinklers sometimes demonstrated better fire control and further limited fire damage. Where only one response–type of sprinkler is allowed, this is the only type of sprinkler proven to provide fire control. Where a choice of response characteristics (SR or QR) is allowed by the tables, each was able to provide fire control; however, the QR sprinklers sometimes demonstrated better fire control and further limited fire damage.

In the testing involving metal containers, only steel containers were tested. Other metal containers, such as aluminum, have not been tested.

Change the title of Table A.16.1.1(b) to read:
Table A.16.1.1(b) Storage Arrangements for Protected Rack Storage of Liquids in Containers and Low Pressure Cylinders, and Portable Tanks

Substantiation: Adding low pressure cylinders.
<table>
<thead>
<tr>
<th>30- Log #110 FLC-SWC (A.16.2.3)</th>
<th>Final Action:</th>
</tr>
</thead>
</table>

**Submitter:** Michael Jacobs, 3M  
**Recommendation:** Revise Table to read:

INSERT 30_L110 (PI #102) Rec HERE

**Substantiation:** Adding low pressure cylinders.