NFPA 1-2018 TASK GROUPS

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Statement of Problem and Substantiation for Public Comment

Major revisions from FR41, FR 43, FR 44, FR 46, FR 56, and FR 120.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 40-NFPA 1-2016 [Chapter F]	

Related Item

First Revision No. 41-NFPA 1-2015 [Section No. 2.3.1]

First Revision No. 43-NFPA 1-2015 [Section No. 2.3.4]

First Revision No. 46-NFPA 1-2015 [Section No. 2.3.7]

First Revision No. 120-NFPA 1-2015 [Section No. 2.3.17]

First Revision No. 44-NFPA 1-2015 [Section No. 2.3.5]

First Revision No. 56-NFPA 1-2015 [Section No. 2.3.20]

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Public Comment No. 51-NFPA 1-2016 [Section No. 2.3.6]

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ASTM E2336, *Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems*, 2014.

ASTM E2393, *Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers*, 2010a.

ASTM E2404, *Standard Practice for Specimen Preparation and Mounting of Textile, Paper or Polymeric (Including Vinyl) and Wood Wall or Ceiling Coverings, ~~and of~~ Facings and ~~Wood~~ Veneers ~~Intended to be Applied on Site Over a Wood Substrate~~ , to Assess Surface Burning Characteristics*, ~~2012~~ 201 5a .

ASTM E2573, *Standard Practice for Specimen Preparation and Mounting of Site-Fabricated Stretch Systems to Assess Surface Burning Characteristics,* 2012.

ASTM E2599, *Standard Practice for Specimen Preparation and Mounting of Reflective Insulation, Radiant Barrier , and Vinyl Stretch Ceiling Materials for Building Applications to Assess Surface Burning Characteristics* , ~~2011~~ 2015 .

ASTM E2652, *Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-Shaped Airflow Stabilizer, at 750 Degrees C*, ~~2012~~ 2016 .

ASTM E2768, *Standard Test Method for Extended Duration Surface Burning Characteristics of Building Materials (30 min Tunnel Test)*, 2011.

ASTM F852, *Standard for Portable Gasoline Containers for Consumer Use*, 2008.

ASTM F976, *Standard for Portable Kerosene Containers for Consumer Use*, 2008.

ASTM F2200, *Standard Specification for Automated Vehicular Gate Construction*, 2014.

Statement of Problem and Substantiation for Public Comment

date updates - It is important to update the standards (especially those associated with fire issues) and this has not been done at the first draft stage.

Related Item

Public Input No. 146-NFPA 1-2015 [Section No. 2.3.6]

Submitter Information Verification

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Submittal Date: Wed May 04 13:55:04 EDT 2016

Public Comment No. 81-NFPA 1-2016 [Section No. 2.3.17]

2.3.17 UL Publications.

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

ANSI/UL 8, *Standard for Water Based Agent Fire Extinguishers*, 2005, revised 2009.

ANSI/UL 9, *Standard for Fire Tests of Window Assemblies*, 2009.

ANSI/UL 10B, *Standard for Fire Tests of Door Assemblies*, 2008, revised 2009.

ANSI/UL 10C, *Standard for Positive Pressure Fire Tests of Door Assemblies*, 2009.

ANSI/UL 30, *Standard for Metal Safety Cans*, 1995, revised 2009.

UL 58, *Standard for Steel Underground Tanks for Flammable and Combustible Liquids*, 1996, revised 1998.

ANSI/UL 80, *Standard for Steel Tanks for Oil Burner Fuels and Other Combustible Liquids*, 2007, revised 2009.

ANSI/UL 142, *Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids*, 2006, revised 2010.

ANSI/UL 147A, *Standard for Nonrefillable (Disposable) Type Fuel Gas Cylinder Assemblies*, 2005, revised 2009.

ANSI/UL 147B, *Standard for Nonrefillable (Disposable) Type Metal Container Assemblies for Butane*, 2005, revised 2008.

ANSI/UL 154, *Standard for Carbon Dioxide Fire Extinguishers*, 2005, revised 2009.

UL 162, *Standard for Safety for Foam Equipment and Liquid Concentrates*, 1994.

ANSI/UL 197, *Standard for Commercial Electric Cooking Appliances*, 2010, revised 2011.

ANSI/UL 263, *Standard for Fire Tests of Building Construction and Materials*, 2011.

ANSI/UL 294, *Standard for Access Control System Units*, 1999, revised 2010.

ANSI/UL 296A, *Standard for Waste Oil-Burning Air-Heating Appliances*, 2010.

ANSI/UL 299, *Standard for Dry Chemical Fire Extinguishers*, 2012.

ANSI/UL 300, *Standard for Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas*, 2005, revised 2010.

ANSI/UL 305, *Standard for Safety Panic Hardware*, 1997, revised 2012.

ANSI/UL 325, *Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems*, 2013.

ANSI/UL 340, *Test for Comparative Flammability of Liquids*, 2009.

ANSI/UL 499, *Standard for Electric Heating Appliances*, 2005.

ANSI/UL 555, *Standard for Fire Dampers*, 2006, revised 2012.

ANSI/UL 555S, *Standard for Smoke Dampers*, 1999, revised 2012.

ANSI/UL 567, *Standard for Emergency Breakaway Fittings, Swivel Connectors and Pipe Connection Fittings for Petroleum Products and LP-Gas*, 2003, revised 2011.

ANSI/UL 626, *Standard for Water Fire Extinguishers*, 2005, revised 2012.

UL 647, *Standard for Unvented Kerosene-Fired Room Heaters and Portable Heaters*, 1993.

ANSI/UL 710B, *Standard for Recirculating Exhaust Systems*, 2004, revised 2009.

ANSI/UL 711, *Standard for Rating and Fire Testing of Fire Extinguishers*, 2004, revised 2009.

ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, 2008, revised 2010.

ANSI/UL 790, *Standard for Safety for Tests for Fire Resistance of Roof Covering Materials*, 2004, revised 2008.

ANSI/UL 842, *Standard for Valves for Flammable Fluids*, 2007, revised 2011.

ANSI/UL 900, *Standard for Air Filter Units*, 2004, revised 2009.

ANSI/UL 913, *Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III Division 1, Hazardous (Classified) Locations,* 2006, revised 2010.

ANSI/UL 924, *Standard for Emergency Lighting and Power Equipment*, 2006, revised 2011.

UL 971, *Standard for Nonmetallic Underground Piping for Flammable Liquids*, 1995, revised 2006.

ANSI/UL 1037, *Standard for Antitheft Alarms and Devices*, 1999, revised 2009.

ANSI/UL 1040, *Standard for Fire Test of Insulated Wall Construction*, 1996, revised 2007.

ANSI/UL 1313, *Standard for Nonmetallic Safety Cans for Petroleum Products,* 1993, revised 2007.

UL 1316, *Standard for Glass-Fiber Reinforced Plastic Underground Storage Tanks for Petroleum Products, Alcohols, and Alcohol-Gasoline Mixtures*, 2006.

UL 1363A, *Outline of Investigation for Special Purpose Relocatable Power Taps* , 2010

UL 1479, *Standard for Fire Tests of Through-Penetration Firestops*, 2003, revised 2010.

UL 1573, *Standard for Stage and Studio Luminaires and Connector Strips*, 2003.

UL 1640, *Standard for Portable Power-Distribution Equipment*, 2007.

ANSI/UL 1715, *Standard for Fire Test of Interior Finish Material*, 1997, revised 2008.

ANSI/UL 1746, *Standard for External Corrosion Protection Systems for Steel Underground Storage Tanks*, 2007.

UL 1803, *Standard for Factory Follow-up on Third Party Certified Portable Fire Extinguishers,* 2012.

UL 1975, *Standard for Fire Tests for Foamed Plastics Used for Decorative Purposes*, 2006.

ANSI/UL 1994, *Standard for Luminous Egress Path Marking Systems*, 2004, revised 2010.

UL 2079, *Standard for Tests for Fire Resistance of Building Joint Systems*, 2004, revised 2008.

UL 2080, *Standard for Fire Resistant Tanks for Flammable and Combustible Liquids,* 2000.

ANSI/UL 2085, *Standard for Protected Aboveground Tanks for Flammable and Combustible Liquids*, 1997, revised 2010.

ANSI/UL 2129, *Standard for Halocarbon Clean Agent Fire Extinguishers*, 2005, revised 2012.

ANSI/UL 2208, *Standard for Solvent Distillation Units*, 2005, revised 2011.

UL 2245, *Standard for Below-Grade Vaults for Flammable Liquid Storage Tanks,* 2006.

UL 2368, *Standard for Fire Exposure Testing of Intermediate Bulk Containers for Flammable and Combustible Liquids*, 2012.

ANSI/UL 2586, *Standard for Hose Nozzle Valves,* 2011, revised 2012.

Statement of Problem and Substantiation for Public Comment

The current code language requires relocatable power taps to be listed, but does not specify what standard is to be used. Referencing specific standards for listing will clarify which relocatable power taps are suitable for specific occupancies and uses.

In addition to the current code requirements for relocatable power taps to be polarized or grounded type with overcurrent protection, which is covered in Sections 13 and 14 of ANSI/UL 1363, requiring the relocatable power taps to be listed in accordance with ANSI/UL 1363 will also address all other applicable safety requirements for relocatable power taps used in occupancies other than healthcare occupancies.

The addition of UL 1363A in this code section will address the specific requirements for relocatable power taps used in General Patient Care Areas or Critical Patient Care Areas as defined by Article 517 of the National Electrical Code for Health Care Facilities. UL 1363A, Outline of Investigation for Special Purpose Relocatable Power Taps. UL 1363A requires compliance with UL 1363, with additional requirements specific to the use, such as the use of hospital-grade receptacle outlets and plugs, and verification of electrical and mechanical integrity when used with medical equipment.

Related Item

Public Input No. 302-NFPA 1-2015 [Section No. 2.3.17]

Public Input No. 301-NFPA 1-2015 [Section No. 3.3.220]

Public Input No. 300-NFPA 1-2015 [Section No. 11.1.4.1]

Submitter Information Verification

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Submittal Date: Sun May 15 11:34:43 EDT 2016

Public Comment No. 29-NFPA 1-2016 [New Section after 3.3.109.1]

3.3.109.1 Animal Housing Facility

Area of a building or structure, including interior and adjacent exterior spaces, where animals are fed, rested, worked, exercised, treated, exhibited, or used for production.

Statement of Problem and Substantiation for Public Comment

This definition is necessary in order to correlate with the re-introduction of Chapter 35 into The Fire Code. This will require renumbering since 3.3.109.1 is already assigned to Hazardous Material Storage Facility.

Related Item

Public Input No. 227-NFPA 1-2015 [New Section after 3.3.108.1]

Submitter Information Verification

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Public Comment No. 17-NFPA 1-2016 [New Section after 3.3.281]

3.3.x Rural.

Those areas that are not unsettled wilderness or uninhabitable territory but are sparsely populated with densities below 500 persons per square mile.

3.3.x Suburb or Suburban.

Those moderately inhabited areas with population densities of at least 500 persons per square mile but less than 1000 persons per square mile.

Statement of Problem and Substantiation for Public Comment

Reconsider PI No. 24. By incorporating definitions for Rural and Suburban in the Chapter 3. These terms are used in Chapter 18 of NFPA 1. The terms are also defined in 1142. Providing direction to the AHJ as to what is a "rural" environment and what is a "suburban" environment is important is important as specific exceptions are provided in Chapter 18 for structures that fall within those definitions. Without clear criteria, the AHJ is left with no guidance as to when those exceptions should apply. Also look at PC 18 as an alternative to this PC.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 18-NFPA 1-2016 [Section No. A.18.4.3.1.1]	

Related Item

Public Input No. 24-NFPA 1-2015 [New Section after 3.3.277]

Submitter Information Verification

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Public Comment No. 9-NFPA 1-2016 [Section No. 7.2.1]

7.2.1 General.

~~Notification systems~~ A risk analysis shall be provided in accordance with *NFPA 72*~~ and the provisions of 7~~ . ~~2.2 through 7.2.4~~ .

Statement of Problem and Substantiation for Public Comment

This section should direct users on where to find the requirement for a risk analysis. (72-24.3.11) Notification requirements should be detailed in Emergency Communications Systems.

Related Item

First Revision No. 112-NFPA 1-2015 [Chapter 7]

Submitter Information Verification

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Submittal Date: Thu Mar 10 12:12:29 EST 2016

Public Comment No. 10-NFPA 1-2016 [Section No. 7.2.2]

~~7.2.2 – Considerations.~~

~~The risk analysis required by 10.5.4.1 shall additionally address all of the following considerations:~~

(1) ~~- Fire and non-fire emergencies~~

(2) ~~- The specific nature and anticipated risks of each facility~~

(3) ~~- Characteristics of associated buildings, areas, spaces, campuses, equipment, and operations~~

Statement of Problem and Substantiation for Public Comment

All these considerations are included in the Risk Analysis detailed in NFPA 72 (24.3.11). There should be no need to reiterate.

Related Item

First Revision No. 112-NFPA 1-2015 [Chapter 7]

Submitter Information Verification

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Submittal Date: Thu Mar 10 12:25:03 EST 2016

Public Comment No. 11-NFPA 1-2016 [Section No. 7.2.4]

7.2.4 Emergency ~~Action~~ Response Plan.

The completed emergency ~~action~~ response plan in accordance with *NFPA 72* shall be used for the design of the mass notification and emergency communication systems.

Statement of Problem and Substantiation for Public Comment

NFPA 72 Uses the term Emergency Response Plan and should remain consistent among standards.

Related Item

First Revision No. 112-NFPA 1-2015 [Chapter 7]

Submitter Information Verification

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Submittal Date: Thu Mar 10 12:31:48 EST 2016

Public Comment No. 22-NFPA 1-2016 [Section No. 10.10.10]

10.10.10 Discontinuance.

The AHJ shall be authorized to require any fire to be immediately discontinued if the fire ~~is~~ or smoke is determined to constitute a hazardous condition.

Statement of Problem and Substantiation for Public Comment

Bon fires in densely populated urban areas can create nuisance issues to neighboring properties where smoke from the bon fires is wind driven into other homes and businesses. The AHJ should have the authority to have the fire discontinued until more appropriate and safe conditions are available.

Related Item

Public Input No. 124-NFPA 1-2015 [Section No. 10.10.10]

Submitter Information Verification

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Public Comment No. 49-NFPA 1-2016 [Section No. 10.13.3]

10.13.3* Provisions for Fire ~~Retardance~~ Test Requirements for Artificial Vegetation.

10.13.3.1

~~Artificial vegetation and~~ Newly introduced artificial vegetation (including artificial Christmas trees) shall be labeled or otherwise identified or certified by the manufacturer as ~~being fire retardant.~~ complying with 10.13.3.2 or 10.13.3.3 and also with 10.13.3.4 and 10.13.3.5.

10.13.3.2

~~Such fire retardance shall be demonstrated by~~

The leaves of the artificial vegetation shall meet the flame propagation performance criteria of Test Method 1 or Test Method 2, as appropriate, of NFPA 701.

10.13.3.3

The complete artificial vegetation item shall exhibit a maximum heat release rate of 100 kW when tested in accordance with NFPA 289 (using the 20 kW ignition source) or with UL 1975.

10.13.3.4

Compliance with either 10.13.3.2 or 10.13.3.3 shall be demonstrated for each individual decorative vegetation item ~~, including any decorative lighting,~~ in an approved manner.

10.13.3.5

Decorative lighting on artificial vegetation shall be listed.

Statement of Problem and Substantiation for Public Comment

I am going to address both the reason for the needed change and the concerns of the committee.

1. The change is needed because calling something "fire retardant" or "flame retardant" is not a meaningful statement since it cannot be complied with unless there is some criterion or criteria applied. A "flame retardant" or a "fire retardant" is just an additive. Therefore, criteria must be added.

2. NFPA 701 does apply to all decorative materials. In order to clarify this further the section related to NFPA 701 has been clarified to indicate that the leaves are to be tested. To show that NFPA 701 does apply to all decorative materials, see the scope, as follows:

NFPA 701 1.1* Scope.
1.1.1* Test Method 1.
1.1.1.1 Test Method 1 shall apply to materials with an areal density less than or equal to 700 g/m2 (21 oz/yd2), including
the following:
(1) Fabrics or other materials used in curtains, draperies, or other window treatments
(2) Single-layer fabrics
(3) Multilayer curtain and drapery assemblies in which the layers are fastened together by sewing or other means
(4) Where required, fabrics with an areal density less than or equal to 700 g/m2 (21 oz/yd2) and used in other construction applications
1.1.1.2 Test Method 1 shall not apply to the following, which shall be tested according to Test Method 2:
(1) Vinyl-coated fabric blackout linings or lined draperies using a vinyl-coated fabric blackout lining
(2) Plastic films
(3) Decorative materials other than fabrics
(4) Other materials where Test Method 2 is required by 1.1.2
1.1.2 Test Method 2.
1.1.2.1 Test Method 2 (flat specimen configuration) shall apply to the following:
(1) Decorative materials other than fabrics meeting the requirements of 1.1.1.1
(2) Fabrics, including multilayered fabrics, films, and plastic blinds, with or without reinforcement or backing, with

areal densities greater than 700 g/m2 (21 oz/yd2)
(3) Vinyl-coated fabric blackout linings and lined draperies using a vinyl-coated fabric blackout lining
(4) Plastic films
(5) Fabrics, with or without reinforcement or backing, used for decorative or other purposes inside a building or as temporary or permanent enclosures for buildings under construction
(6) Fabrics used in the assembly of awnings, tents, tarps, membrane structures or banners
1.1.2.2 Test Method 2 shall not apply to the following:
(1) Materials covered by Test Method 1 (See 1.1.1.)
(2) Wall coverings, ceiling coverings, floor coverings, and other interior finish
1.1.2.3 Test Method 2 shall be used for testing plastic films, with or without reinforcement or backing, when used for decorative or other purposes inside a building or as temporary or permanent enclosures for buildings under construction.

3. As an alternative to NFPA 701, a full scale test to NFPA 289 (which has a section specific to decorative vegetation) is included. Alternate fire codes use both NFPA 701 and NFPA 289 for decorative vegetation.

4. The technical committee was concerned that this might apply to existing vegetation and the comment revised that to make it apply to new only to avoid having to throw out existing decorative vegetation, but I am concerned with the potential serious fire hazard introduced by large Christmas trees (whether natural or artificial).

5. The wording about decorative lighting is in the wrong location as it cannot be tested in the same way as decorations. To a large extent 13.5 and 13.6 take care of that. If the committee feels that safety of decorative lighting is necessary a section was added stating that decorative lighting must be listed.

Related Item

Public Input No. 193-NFPA 1-2015 [Section No. 10.13.3]

Submitter Information Verification

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Submittal Date: Wed May 04 12:54:50 EDT 2016

Public Comment No. 63-NFPA 1-2016 [Section No. 10.18.5.1]

10.18.5.1

Combustible material shall not be stored in boiler rooms, mechanical rooms, or electrical equipment rooms unless the rooms comply with the protection from hazards requirements for storage rooms in NFPA 101 .

Statement of Problem and Substantiation for Public Comment

As this section is currently written, combustible storage that is located in a room that meets the requirements for protection from hazards of NFPA 101 would be in compliance with NFPA 101, but would not meet the requirements of NFPA 1. NFPA 1 would allow no option other than to remove the storage from the room.

This proposed change will align the requirements of NFPA 1 and NFPA 101. If the equipment room is not properly protected against fire in accordance with NFPA 101 (as required for attic spaces in 10.18.6), then NFPA 1 can still be used as a reference to require the removal of the combustible storage.

Related Item

Public Input No. 32-NFPA 1-2015 [Section No. 10.18.5]

Submitter Information Verification

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Public Comment No. 80-NFPA 1-2016 [Section No. 11.1.4.1]

11.1.4.1

Relocatable power taps shall be of the polarized or grounded type with overcurrent protection and shall be listed.

Statement of Problem and Substantiation for Public Comment

The current code language requires relocatable power taps to be listed, but does not specify what standard is to be used. Referencing specific standards for listing will clarify which relocatable power taps are suitable for specific occupancies and uses.

In addition to the current code requirements for relocatable power taps to be polarized or grounded type with overcurrent protection, which is covered in Sections 13 and 14 of ANSI/UL 1363, requiring the relocatable power taps to be listed in accordance with ANSI/UL 1363 will also address all other applicable safety requirements for relocatable power taps used in occupancies other than healthcare occupancies.

The addition of UL 1363A in this code section will address the specific requirements for relocatable power taps used in General Patient Care Areas or Critical Patient Care Areas as defined by Article 517 of the National Electrical Code for Health Care Facilities. UL 1363A, Outline of Investigation for Special Purpose Relocatable Power Taps. UL 1363A requires compliance with UL 1363, with additional requirements specific to the use, such as the use of hospital-grade receptacle outlets and plugs, and verification of electrical and mechanical integrity when used with medical equipment.

Related Item

Public Input No. 300-NFPA 1-2015 [Section No. 11.1.4.1]

Public Input No. 301-NFPA 1-2015 [Section No. 3.3.220]

Public Input No. 302-NFPA 1-2015 [Section No. 2.3.17]

Submitter Information Verification

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Public Comment No. 75-NFPA 1-2016 [Section No. 11.7.2.2]

11.7.2.2

Portable generators shall be positioned ~~so that the exhaust is directed~~ as follows:

(1) At ~~least 5~~ least 20 ft (6. 1 ~~.5~~ m) ~~in any direction away~~ from any openings or air intakes ~~Away~~

(2) in a structure such as a window, door, crawlspace access at or below grade level, or ventilation opening. The distance shall be measured from the generator exhaust sytem termination to the closest point on the structure opening.

(3) The exhaust is pointed away from the building.

Additional Proposed Changes

File Name	Description	Approved
CPSC_staff_proposal_for_NFPA_1_to_address_the_CO_hazard_of_portable_generators.docx	When I entered the change on-line, it inserted it as a 3-part change, but was meant to be only 2 parts. See attached	

Statement of Problem and Substantiation for Public Comment

Rationale: Currently, the Fire Code ("NFPA 1") does not address carbon monoxide ("CO") poisoning hazards for portable generators. Staff of the U.S. Consumer Product Safety Commission ("CPSC") proposes these changes to section 11.7.2.2 of NFPA 1 to reduce the risk of combustion gases exhausted from a generator engine infiltrating a structure so that the risk of CO poisoning injuries and deaths for occupants in the structure will be reduced.

As of May 21, 2015, for the period 2004 through 2014, CPSC databases contained reports of at least 44 non-work-related consumer CO deaths from 31 incidents that resulted from the exhaust of generators operating outdoors, infiltrating into occupied enclosed spaces.(ref 1) In addition, in 10 percent of the of the 292 reported records of CO-related emergency department visits associated with generators, for the same period, CPSC's National Electronic Injury Surveillance System ("NEISS") database indicates that the generator was located outside. NEISS is a national probability sample of hospitals in the United States and its territories. In half of the "Outside the home" scenarios, the NEISS narrative specifically cites the location as near a window, door, or air conditioner.(ref 2) There are other published sources that also show CO deaths and injuries from outdoor operation of portable generators documenting that the injured consumers generally used their portable generators an average of only a few feet away from the nearest door or window.(refs 3 and 4) In 2013, the Centers for Disease Control and Prevention ("CDC") began recommending that portable generators should never be placed less than 20 feet from an open window, door, or vent, where exhaust can vent into an enclosed area.(ref 5) CPSC is now making this recommendation as well. (ref 6) The recommendation is based, in part, on results of modeling studies performed by the National Institute of Standards and Technology ("NIST") regarding the effects on indoor CO concentration profiles of operating an existing, gasoline-fueled carbureted generator outdoors. The studies concluded that placing the generator more than 15 feet away from the structure, with the exhaust pointing away, helps reduce CO infiltration. (refs 7 and 8)

References:

1. Hnatov, Matthew, Carbon Monoxide Deaths Associated with Engine-Driven Generators Located Outdoors in 2004 through 2014, U.S. Consumer Product Safety Commission, Bethesda, MD, November 2015. http://www.cpsc.gov/Global/Research-and-Statistics/Injury-Statistics/Carbon-Monoxide-Posioning /EpiMemosSupportGeneratorNPRpackage.pdf.

2. Hnatov, Matthew, Summary of NEISS Records Associated with Carbon Monoxide Exposure Cases Related to Engine-Driven Generators in 2004 through 2014, U.S. Consumer Product Safety Commission, Bethesda, MD, November 2015. http://www.cpsc.gov/Global/Research-and-Statistics/Injury-Statistics/Carbon-Monoxide-Posioning /EpiMemosSupportGeneratorNPRpackage.pdf.

3. CDC, 2006. Carbon Monoxide Poisonings After Two Major Hurricanes - Alabama and Texas, August - October 2005, Morbidity and Mortality Weekly Report ("MMWR"), United States Centers for Disease Control and Prevention: 4.

4. CDC, Carbon Monoxide Poisoning from Hurricane-Associated Use of Portable Generators- Florida, 2004, MMWR 2005; 54:697-700.

5. Carbon Monoxide Poison Prevention, Centers for Disease Control and Prevention ("CDC") Web page, http://www.cdc.gov/features/copoisoning/

6. U.S. Consumer Product Safety Commission Winter Weather Alert: Generators, CPSC website, http://www.cpsc.gov/onsafety/2014/01/winter-weather-alert-generators/

7. Liangzhu ("Leon") Wang, S. J. Emmerich, NIST Technical Note 1637, Modeling the Effects of Outdoor Gasoline Powered Generator Use on Indoor Carbon Monoxide Exposures, August 2009 ("available online at http://fire.nist.gov/bfrlpubs/build09/art009.html.")

8. Liangzhu ("Leon") Wang, S. J. Emmerich, and R. Powell, NIST Technical Note 1666, Modeling the Effects of Outdoor Gasoline Powered Generator Use on Indoor Carbon Monoxide Exposures – Phase II, July 2010. ("available online at: http://www.cdc.gov/nceh/airpollution/pdfs/cdc_phaseii_tn1666.pdf.")

**This proposal is that of the CPSC staff, has not been reviewed or approved by, and may not necessarily reflect the views of, the Commission.

Related Item

First Revision No. 128-NFPA 1-2015 [Section No. 11.5.2.3]

Submitter Information Verification

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Submittal Date: Fri May 13 10:59:35 EDT 2016

CPSC staff proposal for NFPA 1 *Fire Code* **

NFPA 1 (New revised text is underlined and deleted text is shown with a ~~line through it~~.)

11.7.2.2

Portable generators shall be positioned ~~such that the exhaust is directed~~ as follows:

(1) At least ~~5~~ 20 ft (~~1.5~~ 6.1 m) ~~in any direction away~~ from any openings or air intakes in a structure such as a window, door, crawlspace access at or below grade level, or ventilation opening. The distance shall be measured from the generator exhaust system termination to the closest point on the structure opening.

(2) The exhaust is pointed a~~A~~way from the building.

Public Comment No. 78-NFPA 1-2016 [Section No. 11.7.2.2]

11.7.2.2

Portable generators shall be positioned so that the exhaust is directed as follows:

(1) At least ~~5~~ 20 ft (6. 1 ~~.5~~ m) in any direction away from any openings or air intakes

(2) Away from the building or occupied areas

Statement of Problem and Substantiation for Public Comment

Based on a study by the Centers for Disease Control and Prevention, almost half of the poisonings of carbon monoxide which are non-fatal during the hurricane season of 2004, are caused by outdoor generators which are operated within 7 feet from the house. The study also pointed out that people need specific guidelines on the use of portable generators to prevent poisoning of carbon monoxide.

The CDC, in order to find the safe distance to operate portable generators, teamed up with some building experts from the National Institute of Standards and Technology. Consequently, the NIST conducted studies with the view in mind of determining the safe distance from occupied spaces to operate the generator. The result of their studies suggests that even at a distance of 15 feet, the toxic gas can enter open windows and doors, so the CDC is recommending to only use portable generators more than 20 feet away from occupied buildings, doors, and windows.

Also, as one of the top 4 generator producers, TTi did a study in 2013 to determine the effectiveness between various warning texts and the user perception of an acceptable distance from structures that they should place their portable generator. The results indicated that the user better understands how far to place a generator when a warning is provided, and is even better informed of the potential hazards of CO when provided a frame of reference in the form of a specific distance number (20 feet).

NIST Technical Note 1666
NIST Technical Note 1637
http://www.cdc.gov/co/studies.htm

Related Item

First Revision No. 98-NFPA 1-2015 [New Section after 50.6.3]

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Submittal Date: Fri May 13 16:04:35 EDT 2016

Public Comment No. 59-NFPA 1-2016 [Section No. 11.9.3]

11.9.3

~~The~~ New emergency command center ~~room~~ rooms shall be a minimum of 200 ft^2 (19 m^2) with a minimum dimension of 10 ft (3050 mm).

11.9.3.1 Existing emergency command center rooms shall be maintained with the minimum square footage and dimensions previously approved by the AHJ.

Statement of Problem and Substantiation for Public Comment

As identified during the first draft balloting, the revised dimensions for 11.9.3 would require existing emergency command centers that were previously approved at smaller square footage or dimensions to be expanded to meet the minimums of 11.9.3. This would be an onerous code requirement to place on existing facilities and in many cases, technically infeasible. This comment revises 11.9.3 so that the language applies only to new emergency command centers. A new 11.9.3.1 is added to address existing emergency command centers and to ensure that the square footage and dimensions of such centers are not reduced unless approved by the AHJ.

Related Item

First Revision No. 2-NFPA 1-2015 [Section No. 11.9.3]

Submitter Information Verification

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Submittal Date: Thu May 05 13:33:18 EDT 2016

Public Comment No. 79-NFPA 1-2016 [Section No. 13.1.13]

13.1.13* Integrated Systems.

Where fire alarm systems are integrated with other building systems and equipment in high rise buildings according to Section 20.16.1.1 , the integrated systems shall be tested in accordance with NFPA 4.

Statement of Problem and Substantiation for Public Comment

This language is similar to requirements in the IFC process (see F145-16) that only requires high-rise buildings to use NFPA 4.

Related Item

First Revision No. 134-NFPA 1-2015 [New Section after 13.1.12]

Submitter Information Verification

Submitter Full Name: Jeffrey Hugo
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Affilliation: NFSA
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Submittal Date: Fri May 13 16:26:15 EDT 2016

Public Comment No. 104-NFPA 1-2016 [Section No. 14.5.2.3]

14.5.2.3

Locks, if provided, shall not require the use of a key, a tool, or special knowledge or effort for operation from the egress side. [***101*:**7.2.1.5.3]

Statement of Problem and Substantiation for Public Comment

This is a comment pertaining to Public Input No. 266-NFPA 1-2015 [New Section after 14.5.2.3]. NFPA International should consider reconfiguring its suite of regulatory products that pertain to educational facilities so that, for example, all of these campus safety concepts show up Chapter 11 of NFPA 730 Guide for Premises Security (for educational institutions). That would mean relocating this safety concept from NFPA 1 to NFPA 730.

Related Item

Public Input No. 266-NFPA 1-2015 [New Section after 14.5.2.3]

Submitter Information Verification

Submitter Full Name: Michael Anthony
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Affilliation: University of Michigan Plant Operations
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Submittal Date: Mon May 16 16:50:07 EDT 2016

Public Comment No. 53-NFPA 1-2016 [Section No. 18.2.3.5.1]

18.2.3.5.1 Dimensions.

18.2.3.5.1.1*

Fire department access roads shall have an unobstructed width of not less than 20 ft (6.1 m).

18.2.3.5.1.~~2~~ 1.1 *

Where approved by the AHJ, the width of fire department access roads shall be permitted to be less than the minimum specified in 18.2.3.5.1.1.

18.2.3.5.1. 1.2

The width of fire department access roads shall be increased when the minimum width specified in 18.2. 3 .5.1.1 is not adequate to accomodate fire apparatus movements or anticipated obstructions.

18.2.3.5.1.2

Fire department access roads shall have an unobstructed vertical clearance of not less than 13 ft 6 in. (4.1 m).

18.2.3.5.1.~~3~~ 2 .1

Vertical clearance shall be permitted to be reduced where approved by the AHJ, provided such reduction does not impair access by fire apparatus, and approved signs are installed and maintained indicating the established vertical clearance when approved.

18.2.3.5.1.~~3~~ 2 .2

Vertical clearances ~~or widths~~ shall be increased when vertical clearances ~~or widths~~ are not adequate to accommodate fire apparatus.

Statement of Problem and Substantiation for Public Comment

The first draft included width issues in the same line as vertical clearances. This was not correct formatting as width is addressed in 18.2.3.5.1.1 and not the vertical clearance section. This comment moves the width issue to under 18.2.3.5.1.1 and renumbers the sections as 18.2.3.5.1.1.1 and 18.2.3.5.1.1.2 are modifiers to 18.2.3.5.1.1. The same renumbering has been proposed for the 18.2.3.5.1.2 section so 18.2.3.5.1.2.1 and 18.2.3.5.1.2.2 modify the main paragraph.

Related Item

First Revision No. 153-NFPA 1-2015 [Section No. 18.2.3.4]

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
Organization: Altamonte Springs Building/Fire Safety Division
Street Address:
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Submittal Date: Wed May 04 20:19:15 EDT 2016

Public Comment No. 54-NFPA 1-2016 [Sections 18.2.3.5.3, 18.2.3.5.4, 18.2.3.5.5, 18.2.3.5.6]

Sections 18.2.3.5.3, 18.2.3.5.4, 18.2.3.5.5, 18.2.3.5.6

18.2.3.5.3 Turning Radius.

18.2.3.5.3.1

The turning radius of a fire department access road shall be as approved by the AHJ.

18.2.3.5.3.2

Turns in fire department access roads shall maintain the minimum road width.

18.2.3.5. 3.3

Fire department access roads connecting to roadways shall be provided with curb cuts extending at least 2 ft (0.61) beyond each edge of the fire department access road.

18.2.3.5. 4 _ _ _ Dead Ends.

Dead-end fire department access roads in excess of 150 ft (46 m) in length shall be provided with approved provisions for the fire apparatus to turn around.

18.2.3.5.5 Bridges.

18.2.3.5.5.1

When a bridge is required to be used as part of a fire department access road, it shall be constructed and maintained in accordance with nationally recognized standards.

18.2.3.5.5.2

The bridge shall be designed for a live load sufficient to carry the imposed loads of fire apparatus.

18.2.3.5.5.3

Vehicle load limits shall be posted at both entrances to bridges where required by the AHJ.

18.2.3.5.6 Grade.

18.2.3.5.6.1

The gradient for a fire department access road shall not exceed the maximum approved.

18.2.3.5.6.2*

The angle of approach and departure for any means of fire department access road shall not exceed 1 ft drop in 20 ft (0.3 m drop in 6 m) or the design limitations of the fire apparatus of the fire department, and shall be subject to approval by the AHJ.

~~18.2.3.5.6.3 –~~

~~Fire department access roads connecting to roadways shall be provided with curb cuts extending at least 2 ft (0.61 m) beyond each edge of the fire department access road.~~

Statement of Problem and Substantiation for Public Comment

This comment relocates 18.2.3.5.6.3 to a new 18.2.3.5.3.3. The topic of a curb is more of a "Turning Radius" issue than a "grade" issue. Therefore, it is more appropriate for it to be under 18.2.3.5.3 than 18.2.3.5.6.

Related Item

First Revision No. 153-NFPA 1-2015 [Section No. 18.2.3.4]

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
Organization: Altamonte Springs Building/Fire Safety Division
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Submittal Date: Wed May 04 20:36:07 EDT 2016

Public Comment No. 55-NFPA 1-2016 [Section No. 18.2.3.5.6.1]

~~18.2.3.5.6.1~~ –

~~The gradient for a fire department access road shall not exceed the maximum approved.~~

Statement of Problem and Substantiation for Public Comment

This comment deletes section 18.2.3.5.6.1. As written in the first draft, it is unsure what the intent of this section is relative to 18.2.3.5.6.2 nor does it provide any added value above 18.2.3.5.6.2.

Related Item

First Revision No. 153-NFPA 1-2015 [Section No. 18.2.3.4]

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
Organization: Altamonte Springs Building/Fire Safety Division
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Submittal Date: Wed May 04 20:41:18 EDT 2016

Public Comment No. 56-NFPA 1-2016 [Section No. 18.2.3.5.6.2]

18.2.3.5.6.2*

The angle of approach and departure for any ~~means of~~ fire department access road shall not exceed 1 ft drop in 20 ft (0.3 m drop in 6 m) or the design limitations of the fire apparatus of the fire department, and shall be subject to approval by the AHJ.

Statement of Problem and Substantiation for Public Comment

The inclusion of "means of" does not appear to convey a coherent requirement. Deleting this language simplifies the intent and provides a clearer expectation.

Related Item

First Revision No. 153-NFPA 1-2015 [Section No. 18.2.3.4]

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
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Submittal Date: Wed May 04 20:47:42 EDT 2016

Public Comment No. 57-NFPA 1-2016 [Section No. 18.2.4.2.6.1]

18.2.4.2.6.1

Electric gate systems and operators, where provided, shall be installed, maintained, listed and labeled in accordance with UL 325, *Door, Drapery, Gate, Louver, and Window Operators and Systems*.

Statement of Problem and Substantiation for Public Comment

Inclusion of systems would match the scope of UL 325 and the intent that this section cover the entire gate system and not just the operators. Also added "installed and maintained" as those are key components of of UL 325 compliance.

Related Item

First Revision No. 153-NFPA 1-2015 [Section No. 18.2.3.4]

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
Organization: Altamonte Springs Building/Fire Safety Division
Street Address:
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Submittal Date: Wed May 04 20:54:18 EDT 2016

Public Comment No. 58-NFPA 1-2016 [Section No. 18.2.4.2.6.2]

18.2.4.2.6.2

Gates intended for automatic operation shall be designed, constructed, installed and ~~installed~~ maintained to comply with ASTM F2200, *Standard Specification for Automated Vehicular Gate Construction*.

Statement of Problem and Substantiation for Public Comment

Maintenance of the gate system, in the same condition as it was installed, is imperative to ensure the long term safe operation of the gate. Otherwise, gate components could fail or be disabled and there would be no mechanism for the AHJ to address repairs or safety.

Related Item

First Revision No. 153-NFPA 1-2015 [Section No. 18.2.3.4]

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
Organization: Altamonte Springs Building/Fire Safety Division
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Submittal Date: Wed May 04 21:03:34 EDT 2016

Public Comment No. 60-NFPA 1-2016 [Section No. 30.2.3]

30.2.3 General Construction Requirements.

In major repair garages, where CNG-fueled vehicles, hydrogen-fueled vehicles, LNG-fueled vehicles, or LP-Gas-fueled vehicles are repaired, all applicable requirements of NFPA 52, NFPA2, or NFPA 58, whichever is applicable, shall be met. [**30A:**7.4.2]

Statement of Problem and Substantiation for Public Comment

The proposer agrees with the NFPA1 committee that this section is an extract from NFPA30A. There is a joint NFPA2/NFPA30A committee working on updating the language to reflect that the NFPA Standard Council has moved all hydrogen requirements from NFPA52 to NFPA2, including those for Motor Fueling Dispensing and Repair Garages. In case the joint committee decides otherwise, this public comment is intended to ensure that NFPA2 is referenced for hydrogen requirements in repair garages

Related Item

Public Input No. 312-NFPA 1-2015 [Section No. 30.2.3]

Submitter Information Verification

Submitter Full Name: Spencer Quong
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Submittal Date: Sat May 07 17:27:56 EDT 2016

Public Comment No. 50-NFPA 1-2016 [Section No. 30.2.5 [Excluding any Sub-Sections]]

In areas of repair garages used for repair or servicing of vehicles, floor assemblies shall be constructed of noncombustible materials or, if combustible materials are used in the assembly, they shall be surfaced with approved, nonabsorbent, noncombustible material.

Exception: Slip-resistant, nonabsorbent, interior floor finishes having a critical radiant flux not more than 9.87 Btu/in.^{2} (0.45 W/cm^2), as determined by NFPA 253 or ASTM E648 , Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source, shall be permitted.
*[- **~~30A:~~** - ~~7.4.4~~]*

Statement of Problem and Substantiation for Public Comment

There is no need for this section to be extracted from NFPA 30A. The two test methods are identical and they are recognized as identical by NFPA 101, NFPA 5000 and multiple other NFPA and ICC documents. This includes NFPA 1 (see section 12.5.8.3).

A public input and a public comment have also been submitted to NFPA 30A.

Related Item

Public Input No. 231-NFPA 1-2015 [Section No. 30.2.5]

Submitter Information Verification

Submitter Full Name: Marcelo Hirschler
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Submittal Date: Wed May 04 13:45:20 EDT 2016

Public Comment No. 61-NFPA 1-2016 [New Section after 30.2.8]

30.2.8.1 Hydrogen Systems

Repair garages used for repair of vehicle engine fuel systems fueled by shall meet the requirements for gas detection systems in

NFPA 2, Hydrogen Technologies Code.

Statement of Problem and Substantiation for Public Comment

The proposer agrees with the NFPA1 committee that this section is an extract from NFPA30A. There is a joint NFPA2/NFPA30A committee working on updating the language to reflect that the NFPA Standard Council has moved all hydrogen requirements from NFPA52 to NFPA2, including those for Motor Fueling Dispensing and Repair Garages. In case the joint committee decides otherwise, this public comment is intended to ensure that NFPA2 is referenced for hydrogen requirements in repair garages

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 62-NFPA 1-2016 [Section No. 30.2.8 [Excluding any Sub-Sections]]	

Related Item

Public Input No. 311-NFPA 1-2015 [Section No. 30.2.8]

Submitter Information Verification

Submitter Full Name: Spencer Quong
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Affilliation: Toyota
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Submittal Date: Sat May 07 17:35:23 EDT 2016

Public Comment No. 62-NFPA 1-2016 [Section No. 30.2.8 [Excluding any Sub-Sections]]

Repair garages used for repair of vehicle engine fuel systems fueled by non-odorized gases, with the exception of hydrogen, such as ~~hydrogen and~~ non-odorized LNG/CNG, shall be provided with an approved flammable gas detection system. [**30A:**7.4.7]

Statement of Problem and Substantiation for Public Comment

The proposer agrees with the NFPA1 committee that this section is an extract from NFPA30A. There is a joint NFPA2/NFPA30A committee working on updating the language to reflect that the NFPA Standard Council has moved all hydrogen requirements from NFPA52 to NFPA2, including those for Motor Fueling Dispensing and Repair Garages. In case the joint committee decides otherwise, this public comment is intended to ensure that NFPA2 is referenced for hydrogen requirements in repair garages.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 61-NFPA 1-2016 [New Section after 30.2.8]	

Related Item

Public Input No. 310-NFPA 1-2015 [Section No. 30.2.8 [Excluding any Sub-Sections]]

Submitter Information Verification

Submitter Full Name: Spencer Quong
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Submittal Date: Sat May 07 17:37:30 EDT 2016

Public Comment No. 83-NFPA 1-2016 [Sections 34.10.3, 34.10.4]

Sections 34.10.3, 34.10.4

34.10.3* Outdoor Storage.

34.10.3.1

The storage of wood and wood composite pallets at manufacturing and recycling facility sites shall comply with 34.10.4.

34.10.3.2

Idle pallets stored outside shall be stored in accordance with Table 34.10.3.2(a) and Table 34.10.3.2(b).

Table 34.10.3.2(a) Required Clearance Between Outside Idle Pallet Storage and Other Yard Storage

	Minimum Distance	
Pile Size	ft	m
Under 50 pallets	20	6
50–200 pallets	30	9
Over 200 pallets	50	15

Table 34.10.3.2(b) Required Clearance Between Outside Idle Pallet Storage and Building

	Minimum Distance of Wall from Storage					
	Under 50 Pallets		50 to 200 Pallets		Over 200 Pallets	
Wall Construction	ft	m	ft	m	ft	m
Masonry with no openings	0	0	0	0	15	4.6
Masonry with wired glass in openings, outside sprinklers, and 1-hour doors	0	0	10	3	20	6
Masonry with wired or plain glass, outside sprinklers, and ¾ -hour doors	10	3	20	6	30	9
Wood or metal with outside sprinklers	10	3	20	6	30	9
Wood, metal, or other	20	6	30	9	50	15

34.10.3.3

Idle pallet stacks shall not exceed 15 ft (4.6 m) in height nor shall cover an area of greater than 400 ft^2 (37 m^2). Pallet stacks shall be arranged to form stable piles. A distance of not less than 8 ft (2.4 m) shall separate stacks. Piles shall be no closer than 8 ft (2.4 m) to any property line.

34.10.4 Outside Storage at Manufacturing and Recycling Facilities.

34.10.4.1*

The outside storage of wood and wood composite pallets on the same site as a manufacturing or recycling facility shall comply with 34.10.4.

34.10.4.2

Each site shall maintain a current site plan that includes a general description of the property, the boundaries of the lot, the size and location of all buildings, and that shall include all of the following:

(1) Utilities

(2) Type of construction and presence of sprinkler protection for other buildings on the site

(3) Water supply sources for fire-fighting purposes

(4) Locations of ~~flammable liquid~~ hazardous material storage areas

(5) Location of pallet storage

(6) Equipment protected with a dust collection system

(7) Fire department access routes

(8) Designated smoking areas

(9) Locations of fire alarm control panels

34.10.4.3

The owner or designated representative shall prepare an approved fire prevention plan that includes all of the following:

(1) Frequency of walk-through inspections to verify compliance with the plan

(2) Hot work permit process in accordance with Chapter 41

(3) Preventive maintenance program for equipment associated with the pallet

(4) Inspection, testing, and maintenance of fire protection systems in accordance with Chapter 9

34.10.4.4

The owner or designated representative shall prepare and train employees in an approved emergency evacuation plan in accordance with Section 10.8.

34.10.4.5

The owner or designated representative shall prepare a security management plan based on a security risk assessment and shall make the plan and assessment available to the AHJ upon request.

34.10.4.6

Unless permitted by 34.10.4.10, stacks of pallets shall not be stored within 0.75 times the stack height or 8 ft (2.4 m), whichever is greater, of any property line.

34.10.4.7

Unless permitted by 34.10.4.10, stacks of pallets shall not be stored within 0.75 times the stack height of any important building on site.

34.10.4.8

Pallet stacks shall not exceed 20 ft (6 m) in height.

34.10.4.9*

Fire flow requirements for the site shall be determined by the AHJ.

34.10.4.10

Portable fire extinguishers shall be provided within 75 ft (23 m) of any pallet stack.

34.10.4.11

The AHJ shall be permitted to allow pallet stacks closer to a property line or structure on site where additional fire protection is provided including, but not limited to, the following:

(1) The storage yard areas and materials-handling equipment selection, design, and arrangement are based upon an approved risk assessment.

(2) Automatic fire detection transmits an alarm signal to a supervising station in accordance with *NFPA 72*.

(3) Fire department access roads are provided around all storage areas.

Statement of Problem and Substantiation for Public Comment

The Public Comment does several things.

1. Limits the application of the provisions to wood and wood composite pallets. The section is not intended to apply to metal or plastic pallets.
2. Expands the site plan provisions to include hazardous material storage and not just flammable liquid storage. The provisions now explicitly state that the pallet storage locations are to be identified on the site plan.
3. Provides a minimum clearance to the property line of 8 ft (2.4 m).
4. Editorial clarifications.

In addition, the Public Comment results in the provisions being consistent with what was processed by the ICC Fire Code Committee with a recommendation for Approval as Modified.

Related Item

First Revision No. 159-NFPA 1-2015 [Sections 34.10.3, 34.10.4]

Submitter Information Verification

Submitter Full Name: William Koffel
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Affilliation: National Wooden Pallet and Container Association
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Submittal Date: Mon May 16 07:30:25 EDT 2016

Public Comment No. 25-NFPA 1-2016 [Section No. 34.10.3.1]

34.10.3.1

The storage of pallets at pallet manufacturing and pallet recycling facility sites shall comply with 34.10.4.

Statement of Problem and Substantiation for Public Comment

The Committee statement on FR 159 indicates that the new section was only intended to apply to "manufacturing and recyclers of pallets" along with the justification targeting only "pallet manufactures and recyclers." The current language in 34.10.3.1 leads a user to believe that this section pointer applies to all manufacturing and recycling operations thereby creating potential confusion as to the proper application of this sections vs the other pallet provisions of the code. This public comment clarifies this section to ensure that the is section is limited only to "pallet manufactures and pallet recyclers."

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 23-NFPA 1-2016 [Section No. 34.10.4]	Addresses similar topic
Public Comment No. 24-NFPA 1-2016 [Section No. 34.10.4.8]	Addresses similar topic
Public Comment No. 26-NFPA 1-2016 [Section No. 34.10.4.3]	
Public Comment No. 27-NFPA 1-2016 [Section No. 34.10.4.3]	

Related Item

First Revision No. 159-NFPA 1-2015 [Sections 34.10.3, 34.10.4]

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
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Submittal Date: Fri Mar 25 10:48:34 EDT 2016

Public Comment No. 23-NFPA 1-2016 [Section No. 34.10.4]

34.10.4 Outside Storage at Pallet Manufacturing and Pallet Recycling Facilities.

34.10.4.1 *

The outside storage of pallets on the same site as a pallet manufacturing or pallet recycling facility shall comply with 34.10.4.

34.10.4.2

Each site shall maintain a current site plan that includes a general description of the property, the boundaries of the lot, the size and location of all buildings, and that shall include all of the following:

(1) Utilities

(2) Type of construction and presence of sprinkler protection for other buildings on the site

(3) Water supply sources for fire-fighting purposes

(4) Locations of flammable liquid storage areas

(5) Equipment protected with a dust collection system

(6) Fire department access routes

(7) Designated smoking areas

(8) Locations of fire alarm control panels

34.10.4.3

The owner or designated representative shall prepare an approved fire prevention plan that includes all of the following:

(1) Frequency of walk-through inspections to verify compliance with the plan

(2) Hot work permit process in accordance with Chapter 41

(3) Preventive maintenance program for equipment associated with the pallet

(4) Inspection, testing, and maintenance of fire protection systems

34.10.4.4

The owner or designated representative shall prepare and train employees in an approved emergency evacuation plan in accordance with Section 10.8.

34.10.4.5

The owner or designated representative shall prepare a security management plan based on a security risk assessment and shall make the plan and assessment available to the AHJ upon request.

34.10.4.6

Unless permitted by 34.10.4.10, stacks of pallets shall not be stored within 0.75 times the stack height of any property line.

34.10.4.7

Unless permitted by 34.10.4.10, stacks of pallets shall not be stored within 0.75 times the stack height of any important building on site.

34.10.4.8

Pallet stacks shall not exceed 20 ft (6 m) in height.

34.10.4.9 *

Fire flow requirements for the site shall be determined by the AHJ.

34.10.4.10

Portable fire extinguishers shall be provided within 75 ft (23 m) of any pallet stack.

34.10.4.11

The AHJ shall be permitted to allow pallet stacks closer to a property line or structure on site where additional fire protection is provided including, but not limited to, the following:

(1) The storage yard areas and materials-handling equipment selection, design, and arrangement are based upon an approved risk assessment.

(2) Automatic fire detection transmits an alarm signal to a supervising station in accordance with *NFPA 72*.

(3) Fire department access roads are provided around all storage areas.

Statement of Problem and Substantiation for Public Comment

The Committee statement on FR 159 indicates that this section was only intended to apply to "manufacturing and recyclers of pallets" along with the justification targeting only "pallet manufactures and recyclers." The current title and scope of this section does not limit the section to only manufacturing and recyclers of pallets. It leads a user to believe that is applies to all manufacturing and recycling operations thereby creating potential confusion as to the proper application of this sections vs the other pallet provisions of the code. This public comment clarifies the title and the scope language to ensure that the is section is limited only to "pallet manufactures and recyclers."

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 24-NFPA 1-2016 [Section No. 34.10.4.8]	
Public Comment No. 25-NFPA 1-2016 [Section No. 34.10.3.1]	
Public Comment No. 26-NFPA 1-2016 [Section No. 34.10.4.3]	
Public Comment No. 27-NFPA 1-2016 [Section No. 34.10.4.3]	

Related Item

First Revision No. 159-NFPA 1-2015 [Sections 34.10.3, 34.10.4]

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
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Submittal Date: Fri Mar 25 08:36:53 EDT 2016

Public Comment No. 65-NFPA 1-2016 [Section No. 34.10.4]

34.10.4 Outside Storage at Pallet Manufacturing and Recycling Facilities.

34.10.4.1 *

The outside storage of pallets on the same site as a pallet manufacturing or recycling facility shall comply with 34.10.4.

34.10.4.2

Each site shall maintain a current site plan that includes a general description of the property, the boundaries of the lot, the size and location of all buildings, and that shall include all of the following:

(1) Utilities

(2) Type of construction and presence of sprinkler protection for other buildings on the site

(3) Water supply sources for fire-fighting purposes

(4) Locations of flammable liquid storage areas

(5) Equipment protected with a dust collection system

(6) Fire department access routes

(7) Designated smoking areas

(8) Locations of fire alarm control panels

34.10.4.3

The owner or designated representative shall prepare an approved fire prevention plan that includes all of the following:

(1) Frequency of walk-through inspections to verify compliance with the plan

(2) Hot work permit process in accordance with Chapter 41

(3) Preventive maintenance program for equipment associated with the pallet

(4) Inspection, testing, and maintenance of fire protection systems

34.10.4.4

The owner or designated representative shall prepare and train employees in an approved emergency evacuation plan in accordance with Section 10.8.

34.10.4.5

The owner or designated representative shall prepare a security management plan based on a security risk assessment and shall make the plan and assessment available to the AHJ upon request.

34.10.4.6

Unless permitted by 34.10.4.10, stacks of pallets shall not be stored within 0.75 times the stack height of any property line.

34.10.4.7

Unless permitted by 34.10.4.10, stacks of pallets shall not be stored within 0.75 times the stack height of any important building on site.

34.10.4.8

Pallet stacks shall not exceed 20 ft (6 m) in height.

34.10.4.9 *

Fire flow requirements for the site shall be determined by the AHJ.

34.10.4.10

Portable fire extinguishers shall be provided within 75 ft (23 m) of any pallet stack.

34.10.4.11

The AHJ shall be permitted to allow pallet stacks closer to a property line or structure on site where additional fire protection is provided including, but not limited to, the following:

(1) The storage yard areas and materials-handling equipment selection, design, and arrangement are based upon an approved risk assessment.

(2) Automatic fire detection transmits an alarm signal to a supervising station in accordance with *NFPA 72*.

(3) Fire department access roads are provided around all storage areas.

Statement of Problem and Substantiation for Public Comment

The BCDC agrees with Technical Committee member Tony Apfelbeck's comment that this is intended to apply to pallet manufacturing facilities, not any manufacturing facility with pallets.

Related Item

First Revision No. 159-NFPA 1-2015 [Sections 34.10.3, 34.10.4]

Submitter Information Verification

Submitter Full Name: Jim Muir
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Submittal Date: Tue May 10 12:59:08 EDT 2016

Public Comment No. 67-NFPA 1-2016 [Section No. 34.10.4.1]

34.10.4.1*

The outside storage of wood pallets, or of listed pallets equivalent to wood, on the same site as a manufacturing or recycling facility shall comply with 34.10.4.

Statement of Problem and Substantiation for Public Comment

The proposed change simply clarifies that this section applies to all combustible pallets, namely wood pallets and those plastic (or wood-plastic composite) pallets listed as equivalent to wood pallets. It does not apply to metal pallets.

Section 34.2.4 on pallet types already contains the term "listed pallets equivalent to wood" which is extracted from NFPA 13. Plastic pallets listed and labeled in accordance with UL 2335 or FM 4996 are treated as wood pallets for determining required sprinkler protection.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 68-NFPA 1-2016 [Section No. A.34.10.4.1]	

Related Item

First Revision No. 159-NFPA 1-2015 [Sections 34.10.3, 34.10.4]

Submitter Information Verification

Submitter Full Name: Marcelo Hirschler
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Submittal Date: Tue May 10 16:39:38 EDT 2016

Public Comment No. 26-NFPA 1-2016 [Section No. 34.10.4.3]

34.10.4.3

The owner or designated representative shall prepare an approved fire prevention plan that includes all of the following:

(1) Frequency of walk-through inspections to verify compliance with the plan

(2) Hot work permit process in accordance with Chapter 41

(3) Preventive maintenance program for equipment associated with the pallet manufacturing or pallet recycling facility

(4) Inspection, testing, and maintenance of fire protection systems

Statement of Problem and Substantiation for Public Comment

The current language in the section from FR 159 requires a "preventive maintenance program for equipment associated with the pallet." The sentence appears to be incomplete as to the intended application as there is no maintenance that would occur associated with a pallet. It appears the intent is to required preventative maintenance associated with the equipment involved in pallet manufacturing and recycling. Therefore, this PC has been submitted to clarify this section with the intent of requiring a preventative maintenance program of the manufacturing and recycling equipment.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 23-NFPA 1-2016 [Section No. 34.10.4]	Similar subject matter
Public Comment No. 24-NFPA 1-2016 [Section No. 34.10.4.8]	Similar subject matter
Public Comment No. 25-NFPA 1-2016 [Section No. 34.10.3.1]	Similar subject matter
Public Comment No. 27-NFPA 1-2016 [Section No. 34.10.4.3]	

Related Item

First Revision No. 159-NFPA 1-2015 [Sections 34.10.3, 34.10.4]

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
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Submittal Date: Fri Mar 25 10:56:16 EDT 2016

Public Comment No. 27-NFPA 1-2016 [Section No. 34.10.4.3]

34.10.4.3

The owner or designated representative shall prepare an approved fire prevention plan that includes all of the following:

(1) Frequency of walk-through inspections to verify compliance with the plan

(2) Hot work permit process in accordance with Chapter 41

(3) Preventive maintenance program for equipment associated with the pallet

(4) Inspection, testing, and maintenance of fire protection systems

(5) Frequency of walk-through inspections to verify pallet stack height, area and setbacks are in compliance with this section 34.10.4

Statement of Problem and Substantiation for Public Comment

The current fire protection plan provisions do not require the owner/operator to verify that the pallet stack height, area and setbacks are maintained in accordance with this section. Height, area and setbacks are key issues that need to be monitored and create a significant risk factor.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 23-NFPA 1-2016 [Section No. 34.10.4]	Similar topic
Public Comment No. 24-NFPA 1-2016 [Section No. 34.10.4.8]	Similar topic
Public Comment No. 25-NFPA 1-2016 [Section No. 34.10.3.1]	Similar topic
Public Comment No. 26-NFPA 1-2016 [Section No. 34.10.4.3]	Similar topic

Related Item

First Revision No. 159-NFPA 1-2015 [Sections 34.10.3, 34.10.4]

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
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Submittal Date: Fri Mar 25 11:10:47 EDT 2016

Public Comment No. 24-NFPA 1-2016 [Section No. 34.10.4.8]

34.10.4.8

Pallet stacks shall not exceed 20 ft (6 m) in height nor shall cover an area of greater than 800 ft^2 . Pallet stacks shall be arranged to form stable piles. A distance of not less than 8 ft (2.4 m) shall separate pallet stacks from other pallet stacks.

34.10.4.8.1 When pallet stacks are separated by no less than 20 ft (6 m) from other pallet stacks, the maximum coverage area of a pallet stack shall be permitted to cover no greater than 1600 ft^2 .

34.10.4.8.2 In existing pallet manufacturing and pallet recycling facilities, the AHJ is authorized to approve maximum pallet stack square footage configuations that exceed the limitations of those specified in 34.10.4.8 and 34.10.4.8.1 when such alternative square foot limitations are included as part of the fire protection plan specified in section 34.10.3.

Statement of Problem and Substantiation for Public Comment

The new language in FR 159 contains no limit on the square foot coverage area of a pallet stack. Section 34.10.3.3, which previously covered this, limited pallet stack square foot coverage area to 400 square feet per pallet stack. No justification was provided in FR 159 to permit an unlimited size pallet as is currently permitted in the language adopted within FR 159. However, it is also obvious that the max pile size of 400 square feet is onerous for this type of facility. This PC creates a maximum pile size of 800/1600 square feet depending on separation. The comment also allows for additional alternatives for existing facilities where an AHJ has approved a fie protection plan that would specifically permit alterative square footage arrangements that exceed the 800/1600 square foot thresholds. Regardless of the maximum pallet stack size permitted, there is no justification for an unlimited pallet stack size square foot area as is currently allowed within the FR 159 language and a cap needs to be established with limitations. This PC strikes the balance by providing a cap but also providing the flexibility needed at these facilities.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 23-NFPA 1-2016 [Section No. 34.10.4]	Addresses the same section.
Public Comment No. 25-NFPA 1-2016 [Section No. 34.10.3.1]	
Public Comment No. 26-NFPA 1-2016 [Section No. 34.10.4.3]	
Public Comment No. 27-NFPA 1-2016 [Section No. 34.10.4.3]	

Related Item

First Revision No. 159-NFPA 1-2015 [Sections 34.10.3, 34.10.4]

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
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Submittal Date: Fri Mar 25 10:30:07 EDT 2016

Public Comment No. 82-NFPA 1-2016 [Section No. 34.10.4.8]

34.10.4.8

Pallet stacks shall not exceed 20 ft (6 m) in height.

It appears the provision for a maximum pile size has been eliminated. These facilities are often located in rural areas as part of a rehabilitation or treatment center as a means for fruitful labor and teaching trade skill sets. They are also good revenue generators for the facility. For profit facilities are often located on or adjacent to logging and timber operations. Little regard is given for adequate water supplies; and response times to these facilities is often a non-issue as the fire progression will far exceed response capabilities.

Recommend a maximum pallet stack of 20 ft (6m) in height only in cases where the overall coverage is no greater than 1,000 square feet and located no closer than 15 ft to an adjacent property line of structure.

Statement of Problem and Substantiation for Public Comment

It appears the provision for a maximum pile size has been eliminated. These facilities are often located in rural areas as part of a rehabilitation or treatment center as a means for fruitful labor and teaching trade skill sets. They are also good revenue generators for the facility. For profit facilities are often located on or adjacent to logging and timber operations. Little regard is given for adequate water supplies; and response times to these facilities is often a non-issue as the fire progression will far exceed response capabilities.

By placing a maximum height capacity on pallet storage fire control may be managed much easier.

Related Item

First Revision No. 159-NFPA 1-2015 [Sections 34.10.3, 34.10.4]

Submitter Information Verification

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Submittal Date: Sun May 15 15:48:17 EDT 2016

Public Comment No. 28-NFPA 1-2016 [Chapter 35]

Chapter 35

~~(Reserved)~~ Animal Housing Facilities

35.1 General.

Animal housing facilities shall comply with NFPA 150, *Standard on Fire and Life Safety in Animal Housing Facilities*, and this chapter.

35.2 Permits

Permits, where required, shall comply with Section 1.12.

Statement of Problem and Substantiation for Public Comment

The committee rejected PI 226 during the First Draft meeting stating that the safety of animal handlers is governed by NFPA 101. However, this revision of Chapter 35, which already existed verbatim for two cycles, 2009 and 2012, simply points the reader to NFPA 150 in order to apply its property protection requirements in tandem with NFPA 1, without reference to human safety. The language of PI 226 is not property or life safety-specific, even though property protection and life safety both fall within the parameters of NFPA 1, per 1.2 (Purpose Statement). The rejection statement that life safety is outside the scope of NFPA 1 is, therefore, not only incorrect but doesn't make sense, considering that "life safety for animal handlers" does not appear anywhere in the proposed language in PI 226. Additionally, and to emphasize once again a critical point, the rejection statement during the 2015 revision cycle, namely that many jurisdictions delete Chapter 35 upon adoption has no basis. The technical committee for NFPA 150 received no data to substantiate this. NFPA 101 is set to recognize Animal Housing Facilities in its next edition, as is NFPA 5000. The responsible committee involved here does well to step back and re-evaluate its stance accordingly.

Related Item

Public Input No. 226-NFPA 1-2015 [Chapter 35]

Submitter Information Verification

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Submittal Date: Mon Mar 28 16:00:36 EDT 2016

Public Comment No. 97-NFPA 1-2016 [Chapter 40]

Chapter 40 Dust Explosion and Fire Prevention

40.1 General.

Equipment, processes, and operations that involve the manufacture, processing, blending, repackaging, or handling of combustible particulate solids or combustible dusts regardless of concentration or particle size shall be installed and maintained in accordance with this chapter. All facilities and operations that manufacture, process, blend, convey, repackage, generate, or handle combustible dusts or combustible particulate solids shall be in compliance with NFPA 652 and the following standards as applicable:

(1) NFPA 61, *Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities*

(2) NFPA 69, *Standard on Explosion Prevention Systems*

(3) NFPA 85, *Boiler and Combustion Systems Hazards Code*

(4) NFPA 120, *Standard for Fire Prevention and Control in Coal Mines*

(5) NFPA 484, *Standard for Combustible Metals*

(6)

(7) NFPA 652, ~~*Standard on the Fundamentals of Combustible Dust*~~

(8) ~~NFPA~~ 654, *Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids*

(9) NFPA 655, *Standard for Prevention of Sulfur Fires and Explosions*

(10) NFPA 664, *Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities*

40.2 Permits.

Permits, where required, shall comply with Section 1.12.

~~40.3.2.1.1 * – –~~

~~Where the facility is intended to be operated with less than the dust accumulation defined by the owner/operator's chosen criterion in Section 6.1of NFPA 654, 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 the interior of electrical enclosures, does not exceed the threshold dust mass/accumulation. [**654:** 8.2.1.1~~

40.3
~~– Fugitive Dust Control and Housekeeping.~~

~~40.3.1 – Fugitive Dust Control.~~

~~40.3.1.1 –~~

~~Continuous suction to minimize the escape of dust shall be provided for processes where combustible dust is liberated in normal operation. [**654:** 8.1.1]~~

~~40.3.1.2 –~~

~~The dust shall be conveyed to air-material separators. [**654:** 8.1.2]~~

~~40.3.2 – Housekeeping.~~

~~All requirements of 40.3.2.1 through 40.3.2.3 shall be applied retroactively. [**654:** 8.2]~~

~~40.3.2.1 – Cleaning Frequency.~~

Retroactivity. This chapter shall apply to new and existing facilities and processes. [652:9.1]

40.3.2. 1.2 –

Where the facility is intended to be operated with less than the dust accumulation defined by the owner/operator's chosen criterion in Section 6.1 of NFPA 654, 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. [**654:** 8.2.1.2]

40.3.2.1.3 * – –

Where the facility is intended to be operated with less than the dust accumulation defined by the owner/operator's chosen criterion in Section 6.1 of NFPA 654, the housekeeping procedure shall include specific requirements establishing time to clean local spills or short-term accumulation to allow the elimination of the spilled mass or accumulation from the calculations in Section 6.1 of NFPA 654. [**654:** 8.2.1.3]

40.3.2.1.4 * – –

Where the facility is intended to be operated with more than the dust accumulation defined by the owner/operator's chosen criterion in Section 6.1 of NFPA 654, a documented risk evaluation acceptable to the AHJ shall be permitted to be conducted to determine the level of housekeeping consistent with any dust explosion and dust flash fire protection measures provided in accordance with Section 6.4 and 11.2.2 of NFPA 654. [**654** :8.2.1.4]

40.3.2.2 – Cleaning Methods.

40.3.2.2.1 –

Surfaces shall be cleaned in a manner that minimizes the risk of generating a fire or explosion hazard. [**654:** 8.2.2.1]

40.3.2.2.2 –

Vacuuming shall be the preferred method of cleaning. [**654:** 8.2.2.2]

40.3.2.2.3 –

Where vacuuming is impractical, permitted cleaning methods shall include sweeping and water wash-down. [**654:** 8.2.2.3]

40.3.2.2.4 * – –

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) - Vacuuming, sweeping, or water wash-down methods are first used to clean surfaces that can be safely accessed prior to using compressed air.

(2) - Dust accumulations in the area after vacuuming, sweeping, or water wash-down do not exceed the threshold dust accumulation.

(3) - Compressed air hoses are equipped with pressure relief nozzles limiting the discharge gauge pressure to 30 psi (207 kPa) in accordance with the OSHA requirements in 29 CFR 1910.242(b), "Hand and Portable Power Tools and Equipment, General."

(4) - All electrical equipment potentially exposed to airborne dust in the area meets, as a minimum, the requirements of *NFPA70* , NEMA 12 as defined by NEMA 250; or the 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.

[**654:** 8.2.2.4]

40.3.2.2.5 * – –

Housekeeping procedures shall be documented in accordance with the requirements of Sections 4.2 and 4.3 of NFPA 654. [**654:** 8.2.2.5]

40.3.2.3 – Portable Vacuum Cleaners.

40.3.2.3.1 * – –

Portable vacuum cleaners that meet the following minimum requirements shall be permitted to be used to collect combustible particulate solids:

(1) – Materials of construction shall comply with 7.13.2 and 9.3.2 of NFPA 654.

(2) – Hoses shall be conductive or static dissipative.

(3) – All conductive components, including wands and attachments, shall be bonded and grounded.

(4) – Dust-laden air shall not pass through the fan or blower.

(5) – Electrical motors shall not be in the dust-laden air stream unless listed for Class II, Division 1 locations.

(6) * When liquids or wet material are picked up by the vacuum cleaner, paper filter elements shall not be used.

(7) * Vacuum cleaners used for metal dusts shall meet the requirements of NFPA 484.

[**654:** 8.2.3.1]

40.3.2.3.2 –

In Class II electrically classified (hazardous) locations, vacuum cleaners shall be listed for the purpose and location or shall be a fixed-pipe suction system with remotely located exhauster and air-material separator installed in conformance with Section 7.13 of NFPA 654, and shall be suitable for the dust being collected. [**654:** 8.2.3.2]

40.3.2.3.3 –

Where flammable vapors or gases are present, vacuum cleaners shall be listed for Class I and Class II hazardous locations. [**654:** 8.2.3.3]

40.4 – Ignition Sources.

40.4.1 – Heat from Mechanical Sparks and Friction.

40.4.1.1 – Risk Evaluation.

A documented risk evaluation acceptable to the AHJ shall be permitted to be conducted to determine the level of protection to be provided according to this chapter. [**654:** 9.1.1]

40.4.1.2 – Foreign Materials.

40.4.1.2.1 –

Means shall be provided to prevent foreign material from entering the system when such foreign material presents an ignition hazard. [**654:** 9.1.2.1]

40.4.1.2.2 –

Floor sweepings shall not be returned to any machine. [**654:** 9.1.2.2]

40.4.1.2.3 * – –

Foreign materials, such as tramp metal, that are capable of igniting combustible material being processed shall be removed from the process stream by one of the following methods:

(1) – Permanent magnetic separators or electromagnetic separators that indicate loss of power to the separators

(2) – Pneumatic separators

(3) – Grates or other separation devices

[**654:** 9.1.2.3]

40.4.1.3 * – – Inherently Ignitible Process Streams.

40.4.1.3.1 –

Where the process is configured such that the pneumatic conveying, dust collection, or centralized vacuum cleaning system conveys materials that can act as an ignition source, means shall be provided to minimize the hazard. [**654:** 9.1.3.1]

40.4.1.3.2 –

The means used to minimize the ignition source hazard specified in 40.4.1.3.1 shall be permitted to include protection measures identified in 7.1.1 and Section 10.1 of NFPA 654, as appropriate. [**654:** 9.1.3.2]

40.4.1.4 * – Belt Drives.

Belt drives shall be designed to stall without the belt's slipping, or a safety device shall be provided to shutdown the equipment if slippage occurs. [**654:** 9.1.4]

40.4.1.5 * – Bearings.

40.4.1.5.1 –

Roller or ball bearings shall be used on all processing and transfer equipment. [**654:** 9.1.5.1]

40.4.1.5.2 –

Bushings shall be permitted to be used when a documented engineering evaluation shows that mechanical loads and speeds preclude ignition due to frictional heating. [**654:** 9.1.5.2]

40.4.1.5.3 –

Lubrication shall be performed in accordance with the manufacturer's recommendations. [**654:** 9.1.5.3]

40.4.1.6 – Equipment.

Equipment with moving parts shall be installed and maintained so that true alignment is maintained and clearance is provided to minimize friction. [**654:** 9.1.6]

40.4.2 – Electrical Equipment.

All electrical equipment and installations shall comply with the requirements of Section 6.6 of NFPA 654. [**654:** 9.2]

40.4.3 – Static Electricity.

The requirements of 40.4.3.1 through 40.4.3.1.4 shall be applied retroactively. [**654:** 9.3]

40.4.3.1 –

For electrostatic hazard assessment purposes, MIE determination of dust clouds shall be based on a purely capacitive discharge circuit in accordance with ASTM E2019, *Standard Test Method for Minimum Ignition Energy of a Dust Cloud in Air* . [**654** :9.3.1]

40.4.3.2 * – Conductive Components.

40.4.3.2.1 –

All system components shall be conductive. [**654:** 9.3.2.1]

40.4.3.2.2 –

Nonconductive system components shall be permitted where all of the following conditions are met:

(1) – Hybrid mixtures are not present.

(2) – Conductive dusts are not handled.

(3) – The MIE of the material being handled is greater than 3 mJ.

(4) – The nonconductive components do not result in isolation of conductive components from ground.

(5) * The breakdown strength across nonconductive sheets, coatings, or membranes does not exceed 4 kV when used in high surface charging processes.

[**654:** 9.3.2.2]

40.4.3.2.3 * - –

Bonding and grounding with a resistance of less than 1.0×10^6 ohms to ground shall be provided for conductive components. [**654:** 9.3.2.3]

40.4.3.3 –

Where belt drives are used, the belts shall be electrically conductive and have a resistance of less than 1.0×10^6 ohms to ground. [**654:** 9.3.3]

40.4.3.4 * - – Flexible Intermediate Bulk Containers (FIBCs).

FIBCs shall be permitted to be used for the handling and storage of combustible particulate solids in accordance with the requirements in 40.4.3.4.1 through 40.4.3.4.7 . [**654:** 9.3.4]

40.4.3.4.1 * - –

Electrostatic ignition hazards associated with the particulate and objects surrounding or inside of the FIBC shall be included in the process hazard analysis required by Section 4.2 of NFPA 654. [**654:** 9.3.4.1]

40.4.3.4.2 –

Type A FIBCs shall be limited to use with noncombustible particulate solids or combustible particulate solids having MIE >1000 mJ. [**654:** 9.3.4.2]

40.4.3.4.2.1 –

Type A FIBCs shall not be used in locations where flammable vapors are present. [**654:** 9.3.4.2.1]

40.4.3.4.2.2 * - –

Type A FIBCs shall not be used with conductive particulate solids. [**654:** 9.3.4.2.2]

40.4.3.4.3 –

Type B FIBCs shall be permitted to be used where combustible dusts having MIE >3 mJ are present. [**654:** 9.3.4.3]

40.4.3.4.3.1 –

Type B FIBCs shall not be used in locations where flammable vapors are present. [**654:** 9.3.4.3.1]

40.4.3.4.3.2 * - –

Type B FIBCs shall not be used for conductive particulate solids. [**654:** 9.3.4.3.2]

40.4.3.4.4 –

Type C FIBCs shall be permitted to be used with combustible particulate solids and in locations where flammable vapors having MIE >0.14 mJ are present. [**654:** 9.3.4.4]

40.4.3.4.4.1 –

Conductive FIBC elements shall terminate in a grounding tab, and resistance from these elements to the tab shall be less than 10^8 ohms. [**654:** 9.3.4.4.1]

40.4.3.4.4.2 –

Type C FIBCs shall be grounded during filling and emptying operations with a resistance to ground of less than 25 ohms. [**654:** 9.3.4.4.2]

40.4.3.4.4.3 –

Type C FIBCs shall be permitted to be used for conductive particulate solids. [**654** :9.3.4.4.3]

40.4.3.4.5 –

Type D FIBCs shall be permitted to be used with combustible particulate solids and in locations where flammable vapor atmospheres having MIE >0.14 mJ are present. [**654** :9.3.4.5]

40.4.3.4.5.1 –

Type D FIBCs shall not be permitted to be used for conductive particulate solids. [**654:** 9.3.4.5.1]

40.4.3.4.6 * - –

Type B, Type C, and Type D FIBCs shall be tested and verified as safe for their intended use by a recognized testing organization in accordance with the requirements and test procedures specified in IEC 61340-4-4, *Electrostatics — Part 4-4: Standard Test Methods for Specific Applications — Electrostatic Classification of Flexible Intermediate Bulk Containers* , before being used in hazardous environments. [**654:** 9.3.4.6]

40.4.3.4.6.1 –

Intended use shall include both the product being handled and the environment in which the FIBC will be used. [**654:** 9.3.4.6.1]

40.4.3.4.6.2 –

Materials used to construct inner baffles, other than mesh or net baffles, shall meet the requirements for the bag type in which they are to be used. [**654:** 9.3.4.6.2]

40.4.3.4.6.3 –

Documentation of test results shall be made available to the AHJ. [**654:** 9.3.4.6.3]

40.4.3.4.6.4 –

FIBCs that have not been tested and verified for type in accordance with IEC 61340-4-4, *Electrostatics — Part 4 4: Standard Test Methods for Specific Applications — Electrostatic Classification of Flexible Intermediate Bulk Containers* , shall be not be used for combustible dusts or in flammable vapor atmospheres. [**654:** 9.3.4.6.4]

40.4.3.4.7 * - –

Deviations from the requirements in 40.4.3.4.1 through 40.4.3.4.6 for safe use of FIBCs shall be permitted upon expert review and a documented risk assessment acceptable to the AHJ. [**654:** 9.3.4.7]

40.4.3.5 – Rigid Intermediate Bulk Containers (RIBC).

40.4.3.5.1 * - –

Conductive RIBCs shall be permitted to be used for dispensing into any flammable vapor, gas, dust, or hybrid atmospheres provided that the RIBC is electrically grounded. [**654:** 9.3.5.1]

40.4.3.5.2 * - –

Nonconductive RIBCs shall not be permitted to be used for applications, processes, or operations involving combustible particulate solids or where flammable vapors or gases are present unless a documented risk evaluation assessing the electrostatic hazards is acceptable to the AHJ. [**654:** 9.3.5.2]

40.4.3.6 –

Particulate solids shall not be manually dumped directly into vessels containing flammable atmospheres (gases at a flammable concentration with an oxidant) or where displacement could cause a flammable atmosphere external to the vessel. [**654:** 9.3.6]

40.4.3.7 * - –

Manual additions of solids through an open port or a manway into a vessel containing flammable atmospheres shall be permitted to be done in 50 lb (25 kg) batches or smaller, provided the requirements of 40.4.3.7.1 40.4.3.7.1 through 40.4.3.7.7 40.4.3.7.7 are satisfied. [**654:** 9.3.7]

40.4.3.7.1 * - –

Conductive or static-dissipative components of the container shall be grounded. [**654:** 9.3.7.1]

40.4.3.7.2 –

Direct emptying of powders from nonconductive plastic bags into a vessel that contains a flammable atmosphere shall be strictly prohibited. [**654:** 9.3.7.2]

40.4.3.7.3 –

The use of nonconductive liners in grounded conductive or static-dissipative outer packaging shall be permitted, provided that the liner thickness is less than 0.08 in. (2 mm) and the liner cannot become detached during emptying. [**654:** 9.3.7.3]

40.4.3.7.4 * – –

Loading chutes, receiving vessels, and auxiliary devices used for addition of bulk material shall be conductive and grounded. [**654:** 9.3.7.4]

40.4.3.7.5 * – –

Personnel in the vicinity of openings of vessels that contain flammable atmospheres shall be grounded. [**654:** 9.3.7.5]

40.4.3.7.6 –

Operators shall wear flame-resistant garments as specified in NFPA 2113 and any other personal protective equipment required for protection against flash fire hazards during charging operations. [**654:** 9.3.7.6]

40.4.3.7.7 * – –

A documented risk evaluation acceptable to the AHJ shall be conducted to determine additional engineering and administrative controls necessary to protect against ignition of the flammable atmosphere. [**654:** 9.3.7.7]

40.4.4 – Cartridge-Actuated Tools.

The requirements of 40.4.4.1 through 40.4.4.3 shall be applied retroactively. [**654:** 9.4]

40.4.4.1 –

Cartridge-actuated tools shall not be used in areas where combustible material is produced, processed, or present unless all machinery is shut down and the area is cleaned and inspected to ensure the removal of all accumulations of combustible material. [**654:** 9.4.1]

40.4.4.2 –

Accepted lockout/tagout procedures shall be followed for the shutdown of machinery. [**654:** 9.4.2]

40.4.4.3 –

The use of cartridge-actuated tools shall be in accordance with 40.4.5.2 . [**654:** 9.4.3]

40.4.4.4 –

An inspection shall be made after the work is completed to ensure that no cartridges or charges are left in the area where they can enter equipment or be accidentally discharged after operation of the dust-producing or handling machinery is resumed. [**654:** 9.4.4]

40.4.5 – Open Flames and Sparks.

The requirements of 40.4.5.1 through 40.4.5.3 shall be applied retroactively. [**654:** 9.5]

40.4.5.1 –

Cutting and welding shall comply with the applicable requirements of NFPA 51B. [**654:** 9.5.1]

40.4.5.2 –

Grinding, chipping, and other operations that produce either sparks or open-flame ignition sources shall be controlled by a hot work permit system in accordance with NFPA 51B. [**654:** 9.5.2]

40.4.5.3 –

Smoking shall be permitted only in designated areas. [**654:** 9.5.3]

40.4.6 – Process and Comfort Heating Systems.

40.4.6.1 * – –

In areas processing combustible dust, process and comfort heating shall be provided by indirect means. [**654:** 9.6.1]

40.4.6.2 –

Fired equipment shall be located outdoors or in a separate dust-free room or building. [**654:** 9.6.2]

40.4.6.3 –

Air for combustion shall be taken from a clean outside source. [**654:** 9.6.3]

40.4.6.4 –

Comfort air systems for processing areas containing combustible dust shall not be recirculated. [**654:** 9.6.4]

40.4.6.5 –

Recirculating systems shall be permitted to be used provided that all of the following criteria are met:

(1) - Only fresh makeup air is heated.

(2) - The return air is filtered to prevent accumulations of dust in the recirculating system.

(3) - The exhaust flow is balanced with fresh air intake.

[**654:** 9.6.5]

40.4.6.6 –

Comfort air shall not be permitted to flow from hazardous to nonhazardous areas. [**654:** 9.6.6]

40.4.7 * - – Hot Surfaces.

In areas where a dust explosion hazard or dust flash fire hazard exists, the temperature of external surfaces, such as compressors; steam, water, or process piping; ducts; and process equipment shall be maintained below 80 percent (in degrees Celsius) of the lower of the dust surface ignition temperature or the dust-cloud ignition temperature. [**654:** 9.7]

40.4.8 – Industrial Trucks.

40.4.8.1 –

Where used, industrial trucks shall be listed or approved for the electrical classification of the area, as determined by Section 6.5 of NFPA 654, and shall be used in accordance with NFPA 505. [**654:** 9.8.1]

40.4.8.2 * - –

Where industrial trucks, in accordance with NFPA 505 are not commercially available, a documented risk assessment acceptable to the AHJ shall be permitted to be used to specify the fire and explosion prevention features for the equipment used. [**654:** 9.8.2]

40.5 – Fire Protection.

40.5.1 – General.

Fire protection systems, where installed, shall be specifically designed to address building protection, process equipment, and the chemical and physical properties of the materials being processed. [**654:** 10.1]

40.5.2 – System Requirements.

Fire protection systems required by this chapter shall comply with 40.5.2.1 through 40.5.2.10 . [**654:** 10.2]

40.5.2.1 * - –

Fire-extinguishing agents shall be compatible with the conveyed materials. [**654:** 10.2.1]

40.5.2.2 –

Where fire detection systems are incorporated into pneumatic conveying,dust collection, or centralized vaccum cleaning systems, an analysis shall be conducted to identify safe interlocking requirements for air-moving devices and process operations. [**654:** 10.2.2]

40.5.2.3 –

Where fire-fighting water or wet product can accumulate in the system, vessel and pipe supports shall be designed to support the additional water weight. [**654:** 10.2.3]

40.5.2.4 – Detection Systems.

40.5.2.4.1 –

Where fire detection systems are incorporated into the pneumatic conveying, dust collection, or centralized vacuum cleaning system, the fire detection systems shall be interlocked to shut down any active device feeding materials to the pneumatic conveying, dust collection, or centralized vacuum cleaning system, on actuation of the detection system. [**654:** 10.2.4.1]

40.5.2.4.2 –

Where spark or infrared detection and extinguishing systems are provided, the process shall be permitted to continue operating on activation of the detection system. [**654:** 10.2.4.2]

40.5.2.4.3 –

Where a spark or infrared detection system actuates a diverter valve that sends potentially burning material to a safe location, the process shall be permitted to continue operating on activation of the detection system. [**654:** 10.2.4.3]

40.5.2.5 –

Where the actuation of fire-extinguishing systems is achieved by means of electronic fire detection, the fire detection system, including control panels, detectors, and notification appliances, shall be designed, installed, and maintained in accordance with *NFPA 72* . [**654:** 10.2.5]

40.5.2.6 –

All fire detection initiating devices shall be connected to the fire detection control panel via Style D or E circuits as described in *NFPA 72* . [**654:** 10.2.6]

40.5.2.7 –

All fire detection notification appliances shall be connected to the fire detection control panel via Style Y or Z circuits as described in *NFPA 72* . [**654:** 10.2.7]

40.5.2.8 – System Releasing Devices.

40.5.2.8.1 –

All fire-extinguishing system releasing devices, solenoids, or actuators shall be connected to the fire detection control panel via Style Z circuits as described in *NFPA 72* . [**654:** 10.2.8.1]

40.5.2.8.2 –

The supervision shall include the continuity of the extinguishing system releasing device, whether that device is a solenoid coil, a detonator (explosive device) filament, or other such device. **[654:** 10.2.8.2]

40.5.2.9 –

All supervisory devices that monitor critical elements or functions in the fire detection and extinguishing system shall be connected to the fire detection control panel via Style D or E circuits as described in *NFPA 72* . [**654:** 10.2.9]

40.5.2.10 – Abort Gates and Abort Dampers.

40.5.2.10.1 –

All fire protection abort gates or abort dampers shall be connected to the fire detection control panel via Style Z circuits as described in *NFPA 72* . [**654:** 10.2.10.1]

40.5.2.10.2 –

The supervision shall include the continuity of the abort gate or abort damper releasing device, whether that device is a solenoid coil, a detonator (explosive device) filament, or other such device.
[**654:** 10.2.10.2]

40.5.3 – Fire Extinguishers.

40.5.3.1 –

Portable fire extinguishers shall be provided throughout all buildings in accordance with the requirements of Section 13.6 . [**654:** 10.3.1]

40.5.3.2 * - –

Personnel shall be trained to use portable fire extinguishers in a manner that minimizes the generation of dust clouds during discharge. [**654:** 10.3.2]

40.5.4 – Hoses, Nozzles, Standpipes, and Hydrants.

40.5.4.1 –

Standpipes and hose, where provided, shall comply with Section 13.2 . [**654:** 10.4.1]

40.5.4.2 – Nozzles.

40.5.4.2.1 * - –

Portable spray hose nozzles that are listed or approved for use on Class C fires shall be provided in areas that contain dust, to limit the potential for generating unnecessary airborne dust during fire-fighting operations. [**654:** 10.4.2.1]

40.5.4.2.2 * - –

Straight-stream nozzles shall not be used on fires in areas where dust clouds can be generated. [**654:** 10.4.2.2]

40.5.4.2.3 –

Straight-stream nozzles or combination nozzles shall be permitted to be used to reach fires in locations that are otherwise inaccessible with the nozzles specified in 40.5.4.2.1 . [**654:** 10.4.2.3]

40.5.4.3 –

Private outside protection, including outside hydrants and hoses, where provided, shall comply with Section 13.3 . [**654:** 10.4.3]

40.5.5 * - – Automatic Sprinklers.

40.5.5.1 * - –

Where a process that handles combustible particulate solids uses flammable or combustible liquids, a documented risk evaluation that is acceptable to the AHJ shall be used to determine the need for automatic sprinkler protection in the enclosure in which the process is located. [**654:** 10.5.1]

40.5.5.2 –

Automatic sprinklers, where provided, shall be installed in accordance with Section 13.3 . [**654:** 10.5.2]

40.5.5.3 –

Where automatic sprinklers are installed, dust accumulation on overhead surfaces shall be minimized to prevent an excessive number of sprinkler heads from opening in the event of a fire. [**654:** 10.5.3]

40.5.6 – Spark/Ember Detection and Extinguishing Systems.

Spark/ember detection and extinguishing systems shall be designed, installed, and maintained in accordance with NFPA 69 and Section 13.7 . [**654:** 10.6]

40.5.7 – Special Fire Protection Systems.

40.5.7.1 –

Automatic extinguishing systems or special hazard extinguishing systems, where provided, shall be designed, installed, and maintained in accordance with the following standards, as applicable:.

(1) - NFPA 11, *Standard for Low-, Medium-, and High-Expansion Foam*

(2) - NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*

(3) - NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems*

(4) - NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*

(5) - NFPA 16, *Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems*

(6) - NFPA 17, *Standard for Dry Chemical Extinguishing Systems*

(7) - NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*

(8) - NFPA 750, *Standard on Water Mist Fire Protection Systems*

(9) - NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*

[**654:** 10.7.1]

40.5.7.2 –

The extinguishing systems shall be designed and used in a manner that minimizes the generation of dust clouds during their discharge. [**654:** 10.7.2]

40.5.8 – Alarm Service.

Alarm service, if provided, shall comply with Section 13.7 . [**654:** 10.8]

40.5.9 – Impairments of Fire Protection and Explosion Prevention Systems.

40.5.9.1 * - –

Impairments shall include anything that interrupts the normal intended operation of the fire protection or explosion prevention system. [**654:** 10.9.1]

40.5.9.2 * - –

A written impairment procedure shall be followed for every impairment to the fire protection or explosion prevention system. [**654:** 10.9.2]

40.5.9.3 * - –

Impairments shall be limited in size and scope to the system or portion thereof being repaired, maintained, or modified. [**654:** 10.9.3]

40.5.9.4 * - –

Impairment notification procedures shall be implemented by management to notify plant personnel and the AHJ of existing impairments and their restoration. [**654:** 10.9.4]

40.6 – Training and Procedures.

40.6.1 – Employee Training.

The requirements of 40.6.2 and 40.6.3 shall be applied retroactively. [**654:** 11.1]

40.6.2 – Plan.

40.6.2.1 –

Operating and maintenance procedures shall be developed. [**654:** 11.2.1]

40.6.2.2 * - –

Operating and maintenance procedures shall address personal protective equipment (PPE), including flame-resistant garments, in accordance with the workplace hazard assessment required by NFPA 2113. [**654:** 11.2.2]

40.6.2.3 –

A written emergency response plan shall be developed for preventing, preparing for, and responding to work-related emergencies including but not limited to fire and explosion. [**654:** 11.2.3]

40.6.2.4 –

The plans and procedures shall be reviewed annually and as required by process changes. [**654:** 11.2.4]

40.6.3 – Initial and Refresher Training.

40.6.3.1 –

Initial and refresher training shall be provided to employees who are involved in operating, maintaining, and supervising facilities that handle combustible particulate solids. [**654:** 11.3.1]

~~40.6.3.2 –~~

~~Initial and refresher training shall ensure that all employees are knowledgeable about the following:~~

(1) ~~- Hazards of their workplace~~

(2) ~~- General orientation, including plant safety rules~~

(3) ~~- Process description~~

(4) ~~- Equipment operation, safe startup and shutdown, and response to upset conditions~~

(5) ~~- The necessity for proper functioning of related fire and explosion protection systems~~

(6) ~~- Equipment maintenance requirements and practices~~

(7) ~~- Housekeeping requirements~~

(8) ~~*~~ ~~Emergency response plans~~

~~[**654:** 11.3.2]~~

~~40.6.4 – Certification.~~

~~The employer shall certify annually that the training and review required by 40.6.2 and 40.6.3 have been completed. [**654:** 11.4]~~

~~40.6.5 – Contractors and Subcontractors.~~

~~40.6.5.1 –~~

~~Owner/operators shall ensure that the requirements of 40.6.5.1.1 through 40.6.5.5 are met. [**654** :11.5.1]~~

~~40.6.5.1.1 * – –~~

~~Only qualified contractors possessing the requisite craft skills~~

Existing facilities shall perform a dust hazards analysis (DHA) in accordance with Chapter 7 of NFPA 652.

40.4* General. The procedures and training in this chapter shall be delivered in a language that the participants can understand. [652:9.2]

40.5 Operating Procedures and Practices.

40.5.1* The owner/operator shall establish written procedures for operating its facility and equipment to prevent or mitigate fires, deflagrations, and explosions from combustible particulate solids. [652:9.3.1]

40.5.2* The owner/operator shall establish safe work practices to address hazards associated with maintenance and servicing operations. [652:9.3.2]

40.5.2.1 The safe work practices shall apply to employees and contractors. [652:9.3.2.1]

40.6 Inspection, Testing, and Maintenance.

40.6.1* Equipment affecting the prevention, control, and mitigation of combustible dust fires, deflagrations, and explosions shall be inspected and tested in accordance with the applicable NFPA standard and the manufacturers' recommendations. [652:9.4.1]

40.6.2 The inspection, testing, and maintenance program shall include the following:

(1) Fire and explosion protection and prevention equipment in accordance with the applicable NFPA standards
(2) Dust control equipment
(3) Housekeeping
(4) Potential ignition sources
(5)*Electrical, process, and mechanical equipment, including process interlocks
(6) Process changes
(7) Lubrication of bearings
[652:9.4.2]

40.6.3 The owner/operator shall establish procedures and schedules for maintaining safe operating conditions for its facility and equipment in regard to the prevention, control, and mitigation of combustible dust fires and explosions. [652:9.4.3]

40.6.4* Where equipment deficiencies that affect the prevention, control, and mitigation of dust fires, deflagrations, and explosions are identified or become known, the owner/operator shall establish and implement a corrective action plan with an explicit deadline. [652:9.4.4]

40.6.5* Inspections and testing activities that affect the prevention, control, and mitigation of dust fires, deflagrations, and explosions shall be documented. [652:9.4.5]

40.6.6 A thorough inspection of the operating area shall take place on an as-needed basis to help ensure that the equipment is in safe operating condition and that proper work practices are being followed. [652:9.4.6]

40.7 Training and Hazard Awareness.

40.7.1* Employees, contractors, temporary workers, and visitors shall be included in a training program according to the potential exposure to combustible dust hazards and the potential risks to which they might be exposed or could cause. [652:9.5.1]

40.7.2* General safety training and hazard awareness training for combustible dusts and solids shall be provided to all affected employees. [652:9.5.2]

40.7.2.1* Job-specific training shall ensure that employees are knowledgeable about fire and explosion hazards of combustible dusts and particulate solids in their work environment. [652:9.5.2.1]

40.7.2.2 Employees shall be trained before taking responsibility for a task. [652:9.5.2.2]

40.7.2.3* Where explosion protection systems are installed, training of affected personnel shall include the operations and potential hazards presented by such systems. [652:9.5.2.3]

40.7.3 Refresher training shall be provided as required by the AHJ and as required by other relevant industry- or commodity specific NFPA standards. [652:9.5.3]

40.7.4 The training shall be documented. [652:9.5.4]

40.8 Contractors.

40.8.1 Owner/operators shall ensure the requirements of Section 40.8 are met. [652:9.6.1]

40.8.2* Only qualified contractors shall be employed for work involving the installation, repair, or modification of buildings (interior and exterior), machinery, and fire

~~protection equipment. [**654:** 11.5.1.1]~~

~~40.6.5.1.2 –~~

~~Contractors involved in the commissioning, repair, or modification of explosion protection equipment shall be qualified as specified in Chapter 15 of NFPA 69. [**654:** 11.5.1.2]~~

~~40.6.5.2 – Contractor Training.~~

40.6.5.2.1 –

and explosion protection equipment that could adversely affect the prevention, control, or mitigation of fires and explosions. [652:9.6.2]

40.8.3* Contractor Training.

40.8.3.1 Contractors operating owner/operator equipment shall be trained and qualified to operate the equipment and perform the work. [

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Written documentation shall be maintained detailing the training that was provided and who received it. [**654:** 11.5.2

Contractor training shall be documented. [652:9.6.3 .2]

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* Contractors working on or near a given process shall be made aware of the potential hazards from and exposures to

fire, explosion, or toxic releases

fires and explosions . [

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Contractors shall be trained and required to comply with the facility's safe work practices and policies

, including but not limited to equipment lockout/tagout permitting, hot work permitting, fire system

impairment handling, smoking, housekeeping, and use of personal protective equipment. [**654:** 11.5.4]

40.6.5.5 –

in accordance with 40.5.2. [652:9.6.3.4]

40.8.3.5 Contractors shall be trained on the facility's emergency response and evacuation plan, including , but not limited to , emergency reporting procedures, safe egress points, and evacuation

areas

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7 – Inspection and Maintenance.

40.7.1 – General Requirements.

The requirements of 40.7.1.1 through 40.7.1.3 shall be applied retroactively. [**654:** 12.1]

40.7.1.1 –

An inspection, testing, and maintenance program shall be developed and implemented to ensure that the fire and explosion protection systems and related process controls and equipment perform as designed. [**654:** 12.1.1]

40.7.1.2 –

The inspection, testing, and maintenance program shall include the following:

(1) - Fire and explosion protection and prevention equipment in accordance with the applicable NFPA standards

(2) - Dust control equipment

(3) - Housekeeping

(4) - Potential ignition sources

(5) * Electrical, process, and mechanical equipment, including process interlocks

(6) - Process changes

(7) - Lubrication of bearings

[**654:** 12.1.2]

40.7.1.3 –

Records shall be kept of maintenance and repairs performed. [**654:** 12.1.3]

40.7.1.4 –

Existing facilities shall perform a dust hazards analysis (DHA) in accordance with Chapter 7 of NFPA 652.

40.7.2 – Specific Requirements.

40.7.2.1 – Maintenance of Material Feeding Devices.

40.7.2.1.1 –

Bearings shall be lubricated and checked for excessive wear on a periodic basis. [**654:** 12.2.1.1]

40.7.2.1.2 –

If the material has a tendency to adhere to the feeder or housing, the components shall be cleaned periodically to maintain good balance and minimize the probability of ignition. [**654:** 12.2.1.2]

40.7.2.2 – Maintenance of Air-Moving Devices.

40.7.2.2.1 –

Fans and blowers shall be checked periodically for excessive heat and vibration. [**654:** 12.2.2.1]

40.7.2.2.2 –

Maintenance, other than the lubrication of external bearings, shall not be performed on fans or blowers while the unit is operating. [**654:** 12.2.2.2]

40.7.2.2.3 –

Bearings shall be lubricated and checked periodically for excessive wear. [**654:** 12.2.2.3]

40.7.2.2.4 * – –

If the material has a tendency to adhere to the rotor or housing, the components shall be cleaned periodically to maintain good balance and minimize the probability of ignition. [**654:** 12.2.2.4]

40.7.2.2.5 * – –

The surfaces of fan housings and other interior components shall be maintained free of rust. [**654:** 12.2.2.5]

40.7.2.2.6 –

Aluminum paint shall not be used on interior steel surfaces. [**654:** 12.2.2.6]

40.7.2.3 – Maintenance of Air–Material Separators.

40.7.2.3.1 – Means to Dislodge.

40.7.2.3.1.1 –

Air–material separation devices that are equipped with a means to dislodge particulates from the surface of filter media shall be inspected periodically as recommended in the manufacturers' instructions for signs of wear, friction, or clogging. [**654:** 12.2.3.1.1]

40.7.2.3.1.2 –

These devices shall be adjusted and lubricated as recommended in the manufacturers' instructions. [**654:** 12.2.3.1.2]

40.7.2.3.2 –

Air–material separators that recycle air (i.e., cyclones and filter media dust collectors) shall be maintained to comply with 6.1.3 of NFPA 654. [**654:** 12.2.3.2]

40.7.2.3.3 –

Filter media shall not be replaced with an alternative type unless a thorough evaluation of the fire hazards has been performed, documented, and reviewed by management. [**654:** 12.2.3.3]

40.7.2.4 – Maintenance of Abort Gates and Abort Dampers.

Abort gates and abort dampers shall be adjusted and lubricated as recommended in the manufacturers' instructions. [**654:** 12.2.4]

40.7.2.5 – Maintenance of Fire and Explosion Protection Systems.

40.7.2.5.1 –

All fire detection equipment monitoring systems shall be maintained in accordance with the requirements of 13.7.4.4 . [**654:** 12.2.5.1]

40.7.2.5.2 –

All fire-extinguishing systems shall be maintained pursuant to the requirements established in the standard that governs the design and installation of the system. [**654:** 12.2.5.2]

40.7.2.5.3 * – –

All vents for the relief of pressure caused by deflagrations shall be maintained. [**654:** 12.2.5.3]

~~40.7.2.5.4~~ –

~~All explosion prevention systems and inerting systems shall be maintained pursuant to the requirements of NFPA 69. [**654:** 12.2.5.4]~~

9 Emergency Planning and Response.

40.9.1* A written emergency response plan shall be developed for preparing for and responding to work-related emergencies including, but not limited to, fire and explosion. [652:9.7.1]

40.9.2 The emergency response plan shall be reviewed and validated at least annually. [652:9.7.2]

40.10* Incident Investigation.

40.10.1* The owner/operator shall have a system to ensure that incidents that result in a fire, deflagration, or explosion are reported and investigated in a timely manner. [652:9.8.1]

40.10.2 The investigation shall be documented and include findings and recommendations. [652:9.8.2]

40.10.3 A system shall be established to address and resolve the findings and recommendations. [652:9.8.3]

40.10.4* The investigation findings and recommendations shall be reviewed with affected personnel. [652:9.8.4]

40.11 Management of Change.

40.11.1* Written procedures shall be established and implemented to manage proposed changes to process materials, staffing, job tasks, technology, equipment, procedures, and facilities. [652:9.9.1]

40.11.2 The procedures shall ensure that the following are addressed prior to any change:

(1)*The basis for the proposed change
(2)*Safety and health implications
(3) Whether the change is permanent or temporary, including the authorized duration of temporary changes
(4) Modifications to operating and maintenance procedures
(5) Employee training requirements
(6) Authorization requirements for the proposed change
(7) Results of characterization tests used to assess the hazard, if conducted
[652:9.9.2]

40.11.3* Implementation of the management of change procedure shall not be required for replacements-in-kind. [652:9.9.3]

40.11.4 Design and procedures documentation shall be updated to incorporate the change. [652:9.9.4]

40.12* Documentation Retention.

40.12.1 The owner/operator shall establish a program and implement a process to manage the retention of documentation, including, but not limited to, the following:

(1) Training records
(2) Equipment inspection, testing, and maintenance records
(3)*Incident investigation reports
(4) Dust hazards analyses
(5)*Process and technology information
(6)*Management of change documents
(7) Emergency response plan documents
(8)*Contractor records
[652:9.10.1]

40.13 Management Systems Review.

40.13.1 The owner/operator shall evaluate the effectiveness of the management systems presented in this

standard by conducting a periodic review of each management system. [652:9.11.1]

40.13.2 The owner/operator shall be responsible for maintaining and evaluating the ongoing effectiveness of the management systems presented in this standard. [652:9.11.2]

40.14* Employee Participation. Owner/operators shall establish and implement a system to consult with and actively involve affected personnel and their representatives in the implementation of this standard. [652:9.2]

Additional Proposed Changes

File Name	Description	Approved
Davidson-Chapter_40_Publc_Coment.docx	Language as it should end up.	

Statement of Problem and Substantiation for Public Comment

In furtherance of the application of NFPA 652 as the umbrella dust control standard, the proposed language puts compliance with NFPA 652 in the charging language to make it the first step, then you apply any of the other standards based upon applicability. The proposal deletes the majority of the existing text that was extracted from NFPA 654 primarily and puts an extract of Chapter 9 of NFPA 652 in its place. No requirements are lost, by applying NFPA 652 then the appropriate standard(s) the application of requirements to dust hazards are better structured and improved.

Related Item
Public Input No. 243-NFPA 1-2015 [New Section after 40.1]

Submitter Information Verification

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Submittal Date: Mon May 16 14:18:27 EDT 2016

Chapter 40 Dust Explosion and Fire Prevention

40.1 General. Equipment, processes, and operations that involve the manufacture, processing, blending, repackaging, or handling of combustible particulate solids or combustible dusts regardless of concentration or particle size shall be installed and maintained in accordance with this chapter. All facilities and operations that manufacture, process, blend, convey, repackage, generate, or handle combustible dusts or combustible particulate solids shall be in compliance with NFPA 652 and the following standards as applicable:

(1) NFPA 61, Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities
(2) NFPA 69, Standard on Explosion Prevention Systems
(3) NFPA 85, Boiler and Combustion Systems Hazards Code
(4) NFPA 120, Standard for Fire Prevention and Control in Coal Mines
(5) NFPA 484, Standard for Combustible Metals
(6) NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids
(7) NFPA 655, Standard for Prevention of Sulfur Fires and Explosions
(8) NFPA 664, Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities

40.2 Permits. Permits, where required, shall comply with Section 1.12.

40.3 Retroactivity. This chapter shall apply to new and existing facilities and processes. [652:9.1]

40.3.1 Existing facilities shall perform a Dust Hazards Analysis (DHA) in accordance with Chapter 7 of NFPA 652.

40.4* General. The procedures and training in this chapter shall be delivered in a language that the participants can understand. [652:9.2]

40.5 Operating Procedures and Practices.

40.5.1* The owner/operator shall establish written procedures for operating its facility and equipment to prevent or mitigate fires, deflagrations, and explosions from combustible particulate solids. [652:9.3.1]

40.5.2* The owner/operator shall establish safe work practices to address hazards associated with maintenance and servicing operations. [652:9.3.2]

40.5.2.1 The safe work practices shall apply to employees and contractors. [652:9.3.2.1]

40.6 Inspection, Testing, and Maintenance.

40.6.1* Equipment affecting the prevention, control, and mitigation of combustible dust fires, deflagrations, and explosions shall be inspected and tested in accordance with the applicable NFPA standard and the manufacturers' recommendations. [652:9.4.1]

40.6.2 The inspection, testing, and maintenance program shall include the following:

(1) Fire and explosion protection and prevention equipment in accordance with the applicable NFPA standards
(2) Dust control equipment
(3) Housekeeping
(4) Potential ignition sources
(5)*Electrical, process, and mechanical equipment, including process interlocks
(6) Process changes
(7) Lubrication of bearings
[652:9.4.2]

40.6.3 The owner/operator shall establish procedures and schedules for maintaining safe operating conditions for its facility and equipment in regard to the prevention, control, and mitigation of combustible dust fires and explosions. [652:9.4.3]

40.6.4* Where equipment deficiencies that affect the prevention, control, and mitigation of dust fires, deflagrations, and explosions are identified or become known, the owner/operator shall establish and implement a corrective action plan with an explicit deadline. [652:9.4.4]

40.6.5* Inspections and testing activities that affect the prevention, control, and mitigation of dust fires, deflagrations, and explosions shall be documented. [652:9.4.5]

40.6.6 A thorough inspection of the operating area shall take place on an as-needed basis to help ensure that the equipment is in safe operating condition and that proper work practices are being followed. [652:9.4.6]

40.7 Training and Hazard Awareness.

40.7.1* Employees, contractors, temporary workers, and visitors shall be included in a training program according to the potential exposure to combustible dust hazards and the potential risks to which they might be exposed or could cause. [652:9.5.1]

40.7.2* General safety training and hazard awareness training for combustible dusts and solids shall be provided to all affected employees. [652:9.5.2]

40.7.2.1* Job-specific training shall ensure that employees are knowledgeable about fire and explosion hazards of combustible dusts and particulate solids in their work environment. [652:9.5.2.1]

40.7.2.2 Employees shall be trained before taking responsibility for a task. [652:9.5.2.2]

40.7.2.3* Where explosion protection systems are installed, training of affected personnel shall include the operations and potential hazards presented by such systems. [652:9.5.2.3]

40.7.3 Refresher training shall be provided as required by the AHJ and as required by other relevant industry- or commodity specific NFPA standards. [652:9.5.3]

40.7.4 The training shall be documented. [652:9.5.4]

40.8 Contractors.

40.8.1 Owner/operators shall ensure the requirements of Section 40.8 are met. [652:9.6.1]

40.8.2* Only qualified contractors shall be employed for work involving the installation, repair, or modification of buildings (interior and exterior), machinery, and fire and explosion protection equipment that could adversely affect the prevention, control, or mitigation of fires and explosions. [652:9.6.2]

40.8.3* Contractor Training.

40.8.3.1 Contractors operating owner/operator equipment shall be trained and qualified to operate the equipment and perform the work. [652:9.6.3.1]

40.8.3.2 Contractor training shall be documented. [652:9.6.3.2]

40.8.3.3* Contractors working on or near a given process shall be made aware of the potential hazards from and exposures to fires and explosions. [652:9.6.3.3]

40.8.3.4 Contractors shall be trained and required to comply with the facility's safe work practices and policies in accordance with 40.5.2. [652:9.6.3.4]

40.8.3.5 Contractors shall be trained on the facility's emergency response and evacuation plan, including, but not limited to, emergency reporting procedures, safe egress points, and evacuation area. [652:9.6.3.5]

40.9 Emergency Planning and Response.

40.9.1* A written emergency response plan shall be developed for preparing for and responding to work-related emergencies including, but not limited to, fire and explosion. [652:9.7.1]

40.9.2 The emergency response plan shall be reviewed and validated at least annually. [652:9.7.2]

40.10* Incident Investigation.

40.10.1* The owner/operator shall have a system to ensure that incidents that result in a fire, deflagration, or explosion are reported and investigated in a timely manner. [652:9.8.1]

40.10.2 The investigation shall be documented and include findings and recommendations. [652:9.8.2]

40.10.3 A system shall be established to address and resolve the findings and recommendations. [652:9.8.3]

40.10.4* The investigation findings and recommendations shall be reviewed with affected personnel. [652:9.8.4]

40.11 Management of Change.

40.11.1* Written procedures shall be established and implemented to manage proposed changes to process materials, staffing, job tasks, technology, equipment, procedures, and facilities. [652:9.9.1]

40.11.2 The procedures shall ensure that the following are addressed prior to any change:

(1)*The basis for the proposed change
(2)*Safety and health implications
(3) Whether the change is permanent or temporary, including the authorized duration of temporary changes
(4) Modifications to operating and maintenance procedures
(5) Employee training requirements
(6) Authorization requirements for the proposed change
(7) Results of characterization tests used to assess the hazard, if conducted
[652:9.9.2]

40.11.3* Implementation of the management of change procedure shall not be required for replacements-in-kind. [652:9.9.3]

40.11.4 Design and procedures documentation shall be updated to incorporate the change. [652:9.9.4]

40.12* Documentation Retention.

40.12.1 The owner/operator shall establish a program and implement a process to manage the retention of documentation, including, but not limited to, the following:

(1) Training records
(2) Equipment inspection, testing, and maintenance records
(3)*Incident investigation reports
(4) Dust hazards analyses
(5)*Process and technology information
(6)*Management of change documents
(7) Emergency response plan documents
(8)*Contractor records
[652:9.10.1]

40.13 Management Systems Review.

40.13.1 The owner/operator shall evaluate the effectiveness of the management systems presented in this standard by conducting a periodic review of each management system. [652:9.11.1]

40.13.2 The owner/operator shall be responsible for maintaining and evaluating the ongoing effectiveness of the management systems presented in this standard. [652:9.11.2]

40.14* Employee Participation. Owner/operators shall establish and implement a system to consult with and actively involve affected personnel and their representatives in the implementation of this standard. [652:9.2]

A.40.4 See ANSI/AIHA Z10-2012, Occupational Health and Safety Management Systems. [652:A.9.2]

A.40.5.1 The operating procedures should address both the normal operating conditions and the safe operating limits. Where possible, the basis for establishing the limits and the consequences of exceeding the limits should also be described.

The operating procedures should address all aspects of the operation, including the following (as applicable):

(1) Normal startup
(2) Continuous operation
(3) Normal shutdown
(4) Emergency shutdown
(5) Restart after normal or emergency shutdown
(6) Anticipated process upset conditions
(7) System idling

For manual operations, the procedures and practices should describe techniques, procedural steps, and equipment that are intended to minimize or eliminate combustible dust hazards.

Operating procedures and practices should be reviewed on a periodic basis, typically annually, to ensure they are current and accurate.
[652:A.9.3.1]

A.40.5.2 Safe work practices include, but are not limited to, hot work, confined space entry, and lockout/tagout, and the use of personal protective equipment. (See NFPA 51B.) Consideration for extending the duration of the fire watch could be warranted based on characteristics of the material, equipment configuration, and conditions. For example, the PRB Coal Users' Group practice for hot work suggests fire watches could be warranted for 2 to 12 hours following the completion of hot work due to the exothermic chemical reaction of subbituminous coals. In addition to the hazards of combustible dust, safe work practices should address the hazards of mitigation systems such as inerting and suppression. [652:A.9.3.2]

A.40.6.1 Process interlocks and protection systems should be inspected, calibrated, and tested in the manner in which they are intended to operate, with written records maintained for review. In this context, "test" implies a nondestructive means of verifying that the system will operate as intended. For active explosion protection systems, this can involve the disconnection of final elements (i.e., suppression discharge devices or fast-acting valve actuators) and the use of a simulated signal to verify the correct operation of the detection and control system. Testing can also include slow-stroke activation of fast acting valves to verify unrestricted travel. Some devices, such as explosion vent panels, suppression discharge devices, and some fast-acting valve actuators, cannot be functionally "tested" in a nondestructive manner, and so only

periodic, preventive, and predictive inspection, maintenance, and replacement (if necessary) are applied.

Inspection and maintenance requirements for explosion vents and other explosion protection systems are found in NFPA 68, and NFPA 69, respectively.
[652:A.9.4.1]

A.40.6.2(5) Process interlocks should be calibrated and tested in the manner in which they are intended to operate, with written test records maintained for review by management. Testing frequency should be determined in accordance with the AIChE Guidelines for Safe Automation of Chemical Processes.[654: A.12.1.2(5)] [652:A.9.4.2(5)]

A.40.6.4 Corrective actions should be expedited on high-risk hazards (those that could result in a fatality or serious injury). Where in-kind repairs cannot be promptly implemented, consideration should be given to providing alternate means of protection. [652:A.9.4.4]

A.40.6.5 See Section 9.10 for information regarding document retention. [652:A.9.4.5]

A.40.7.1 Safety of a process depends on the employees who operate it and the knowledge and understanding they have of the process. It is important to maintain an effective and ongoing training program for all employees involved. Operator response and action to correct adverse conditions, as indicated by instrumentation or other means, are only as good as the frequency and thoroughness of training provided. [652:A.9.5.1]

A.40.7.2 All plant personnel, including management; supervisors; and operating, housekeeping, and maintenance personnel should receive general awareness training for combustible dust hazards, commensurate with their job responsibilities, including training on locations where hazards can exist on site, appropriate measures to minimize hazards, and response to emergencies. [652:9.5.2]

A.40.7.2.1 Safe work habits are developed and do not occur naturally. The training program should provide enough background information regarding the hazards of the materials and the process so that the employees can understand why it is important to follow the prescribed procedures. Training should address the following:

(1) The hazards of their working environment and procedures in case of emergencies, including fires, explosions, and hazardous materials releases.
(2) Operating, inspection, testing, and maintenance procedures applicable to their assigned work
(3) Normal process procedures as well as emergency procedures and changes to procedures
(4) Emergency response plans, including safe and proper evacuation of their work area and the permissible methods for fighting incipient fires in their work area
(5) The necessity for proper functioning of related fire and explosion protection systems
(6) Safe handling, use, storage, and disposal of hazardous materials used in the employees' work areas
(7) The location and operation of fire protection equipment, manual pull stations and alarms, emergency phones, first-aid supplies, and safety equipment
(8) Equipment operation, safe startup and shutdown, and response to upset conditions
[652:9.5.2.1]

A.40.7.2.3 The extent of this training should be based on the level of interaction the person is expected to have with the system. For example, operators need to be aware of the hazards presented by explosion suppression systems but might not need to know how to operate the suppression system (e.g., interfacing with the system control panel or locking out devices). Maintenance personnel, on the other hand, might need to know how and when to lock out the devices and how to return the system to its operational state. [652:A.9.5.2.3]

A.40.8.2 Qualified contractors should have proper credentials, which include applicable American Society of Mechanical Engineers (ASME) stamps, professional licenses, and so forth. [652:A.9.6.2]

A.40.8.3 It is suggested that annual meetings be conducted with regular contractors to review the facility's safe work practices and policies. Some points to cover include to whom the contractors would report at the facility, who at the facility can authorize hot work or fire protection impairments, and smoking and nonsmoking areas. The owner/operator does not necessarily need to provide the training to the contractor. [652:A.9.6.3]

A.40.8.3.3 In addition to the combustible dust fire and explosion hazards, contractors should also be made aware of other potential process and occupational hazards. There can be combustible materials other than combustible dusts in the equipment or immediate vicinity where contractors might be working. Combustion of dusts can generate toxic products, and some combustible dusts are acutely toxic. [652:A.9.6.3.3]

A.40.9.1 All plant personnel, including management, supervisors, and maintenance and operating personnel, should be trained to participate in plans for controlling plant emergencies.

The emergency plan should contain the following elements:

(1) A signal or alarm system
(2) Identification of means of egress
(3) Minimization of effects on operating personnel and the community
(4) Minimization of property and equipment losses
(5) Interdepartmental and interplant cooperation
(6) Cooperation of outside agencies
(7) The release of accurate information to the public

Emergency drills should be performed annually by plant personnel. Malfunctions of the process should be simulated and emergency actions undertaken. Disaster drills that simulate a major catastrophic situation should be undertaken periodically with the cooperation and participation of public fire, police, and other local community emergency units and nearby cooperating plants.

Specialized training for public fire department(s) and industrial fire brigades can be warranted due to facility specific hazards where the methods to control and extinguish a fire can be outside of their normal arena of traditional fire fighting.
[652:A.9.7.1]

A.40.10 To thoroughly assess the risks, analyze the incident, and take any corrective steps necessary, investigations should be conducted promptly based on the nature of the incident and in coordination with the AHJ (as applicable).

The investigation should include root cause analysis and should include a review of existing control measures and underlying systemic factors. Appropriate corrective action should be taken to prevent recurrence and to assess and monitor the effectiveness of actions taken.

Such investigations should be carried out by trained persons (internal or external) and include participation of workers. All investigations should conclude with a report on the action taken to prevent recurrence.

Investigation reports should be reviewed with all affected personnel and their representatives (including contract employees where applicable) whose job tasks are relevant to the incident findings, and with the health and safety committee, to make any appropriate recommendations. Any recommendations from the safety and health committee should be communicated to the appropriate persons for corrective action, included in the management review, and considered for continual improvement activities.

A system should be established to promptly address and resolve the incident report findings and recommendations.

Corrective actions resulting from investigations should be implemented in all areas where there is a risk of similar incidents and subsequently checked to avoid repetition of injuries and incidents that gave rise to the investigation.

Reports produced by external investigation agencies should be acted upon in the same manner as internal investigations.

Incident investigation reports should be made available to affected employees and their representatives at no cost.
[652:A.9.8]

A.40.10.1 Events where there are injuries, equipment damage, or significant business interruption are subject to investigation.

In addition to investigation of fires and explosions, it is also a good practice to investigate near misses (events that could have resulted in fires or explosions under different circumstances) and all activations of active fire and explosion mitigation systems. It is important to educate facility personnel on the concept of what a near miss is and to clearly communicate their responsibility for reporting both incidents and near misses.

Near-miss events often indicate an underlying problem that should be corrected. See NFPA 654 for additional information. Barriers to reporting should be removed, as described in ANSI/AIHA Z10, Occupational Health and Safety Management Systems. Investigations should include workers and their representatives, as appropriate.
[652:A.9.8.1]

A.40.10.4 The term affected personnel is intended to include members of employee organizations such as safety committees and employee representatives of various types.
[652:A.9.8.4]

A.40.11.1 It is essential to have thorough written documentation, as the slightest changes to procedures, processes, resources, staffing, and equipment, including equipment from suppliers, can have a dramatic impact on the overall hazard analysis. Change includes something as

benign as process materials sourcing from a different manufacturer, the same raw material manufacturer using new methods to produce the product, or changes in formulation. These changes from a supplier's end can impact the characteristics of the processes and materials. Individuals involved should include those involved in the process such as maintenance, engineering, and purchasing personnel, and all others as deemed necessary. Staffing and job tasks are not intended for shift changes, but for overall staff and their representative tasks. For reference, see the documentation form in ANSI/AIHA Z10, Occupational Health and Safety Management Systems.

The following changes in material or process should warrant a management of change review per Section 9.9, and new samples should be collected and analyzed:

(1) New process equipment is installed that presents new hazards.
(2) New operating conditions for existing equipment create a new hazard.
(3) A new material is used in the process.
[652:A.9.9.1]

A.40.11.2(1) The proposed change and why it is needed should be described. It should include sufficient technical information to facilitate review by the approvers, address adverse effects that could occur, and describe how such effects would be mitigated by the proposed change. [652:A.9.2.(1)]

A.40.11.2(2) Some fire and explosion protection systems introduce additional hazards into the process environment. These hazards can include, but are not limited to, energy in suppression canisters, asphyxiation hazards from inert gases, and mechanical laceration/amputation hazards from explosion isolation systems. While these are not fire or explosion hazards, they should be addressed as part of the management of change review per this document so that appropriate controls can be applied. [652:A.9.9.2(2)]

A.40.11.3 While implementation of the management of change procedure is not required for replacement in kind, it is critical that only qualified personnel are the ones who determine if the replacement is "in kind." These qualified personnel should be intimately familiar with the items listed in 9.9.2, as well as the broad scope of hazards associated with the particular process.

Replacement "in kind" for raw materials. Care must be taken when substituting raw materials. There have been cases where a seemingly equivalent material substitution resulted in a large change in the process hazard. Not all safety properties of a material are characterized in, for example, an MSDS. Chemical composition might be identical, but quite different static ignition hazards due to bulk resistivity and charge relaxation rate can appreciably increase the hazard. Flowability differences can affect the hazard probability too. Differences in natural raw materials are generally less of a concern than manufactured materials in this regard.
[652:A.9.9.3]

A.40.12 The creation and retention of documentation is necessary in order to implement and periodically evaluate the effectiveness of the management systems presented in this standard. Documentation in any form (e.g., electronic) should remain legible and be readily identifiable and accessible. The documentation should be protected against damage, deterioration, or loss, and retained for the applicable period specified in this standard. [652:A.9.10]

A.40.12.1(3) Incident investigation reports should be maintained for review during cyclical hazards evaluation reviews at least until the changes are incorporated in the dust hazard analysis and for compliance with other regulatory requirements. [652:A.9.10.1(3)]

A.40.12.1(5) Process and technology information includes process performance parameters, properties of the materials being handled, and documents such as design drawings, design codes and standards used as the basis for both the process and the equipment, equipment manufacturers' operating and maintenance manuals, standard operating procedures, and safety systems operation. [652:A.9.10.1(5)]

A.40.12.1(6) Management of change documents should be retained until the changes are incorporated into the next dust hazards analysis. [652: A.9.10.1(6)]

A.40.12.1(8) Contractor records typically include information such as the contract documentation with scope of work and necessary insurance coverage, the contractor's safety programs, records demonstrating the contractor's safety performance, qualifications and certifications necessary for the work to be done, periodic evaluations of the contractor's work performance, and records demonstrating that the employees of the contractor have been trained to safely perform the assigned work. [652:A.9.10.1(8)]

A.40.14 Effective employee participation is an essential element of the Occupational Health and Safety Management System (OHSMS) to achieve continuous improvement in risk reduction, as described in ANSI/AIHA Z10-2012, Occupational Health and Safety Management Systems. The OHSMS ensures that employees and their authorized representatives are involved, informed, and trained on all aspects of health associated with their work, including emergency arrangements. Employee participation includes items such as, but not limited to, the following:

(1) Involving employees and their authorized representatives, where they exist, in establishing, maintaining, and evaluating the OSHMS
(2) An occupational health and safety committee
(3) Access to safety and health information
(4) Risk assessment, implementation, and review of risk control measures
(5) Incident and near-miss investigations
(6) Inspections and audits
(7) Reporting unsafe conditions, tools, equipment, and practices
(8) Mentoring of new employees, apprentices, and for onsite orientation
(9) Identifying hazards with strong emphasis on high-risk jobs and the application of the hierarchy of controls
(10) In accordance with established and maintained procedures, appropriate arrangements to ensure that concerns, ideas, and input that employees and their representatives share are received, considered, and responded to
(11) Employees removing themselves from work situations that they have reasonable justification to believe present an imminent and serious danger to their safety or health

Employees who justifiably take those actions by notifying their supervisor should be protected from discrimination by removing those barriers as outlined in the OSHMS.

Where this standard and annex refer to employees and their representatives (where representatives exist), the intention is that they should be consulted as the primary means to achieve appropriate participation in the development and implementation of all aspects of the

OHSMS. In some instances, it might be appropriate to involve all employees and all representatives.

Employee participation is a key component of an OHSMS. When employees and their representatives are engaged and their contributions are taken seriously, they tend to be more satisfied and committed to the OHSMS, and the system is more effective. Engaging employees and their representatives in dialogue with management and each other about safety and health can lead to improved relationships, better overall communication, improved compliance, and reduced rates of injury, illness, and death. The improved morale translates to greater safety and health results.

Employees and their representatives need to be trained about how the OHSMS works and to evaluate it periodically to determine whether improvements need to be made. The information needs to be presented in a form and language that employees and their representatives easily understand.
(See also A.40.10.4.)
[652: A.9.12]

Public Comment No. 64-NFPA 1-2016 [Chapter 46]

~~Chapter 46 – Reserved~~

~~Reserved~~

46.6.3.3.2 Systems and equipment. Systems or equipment used for the extraction of marijuana/cannabis oils and products from plant material shall be performed using equipment that has been listed for the specific use. If the system used for extraction of marijuana/cannabis oils and products from plant material is not listed, then system shall have a ~~designer of record~~ registered design professional. If the ~~designer of record~~ registered design professional is not a licensed Professional Engineer, then the system shall be peer reviewed by a licensed Professional Engineer. In reviewing the system, the licensed Professional Engineer shall review and consider any information provided by the system's designer or manufacturer. For systems and equipment not listed for the specific use, a technical report documenting the design or peer review as outlined in 46.6.3.3.4.2 shall be prepared and submitted to the fire code official for review and approval for systems and equipment used for the extraction of marijuana/cannabis oils and products from plant material. The firm or individual performing the performing the engineering analysis for the technical report shall be approved by the fire code official prior to performing the analysis.

Statement of Problem and Substantiation for Public Comment

The draft of Chapter 46 uses the term "engineer of record" in several places, such as 46.6.3.3.2, and 46.6.3.3.4.1. The term "registered design professional" is used in NFPA 5000. Consideration should be given to using the term "registered design professional."

Related Item

Committee Input No. 152-NFPA 1-2015 [Chapter 46]

Submitter Information Verification

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Submittal Date: Tue May 10 12:48:10 EDT 2016

Public Comment No. 41-NFPA 1-2016 [Section No. 50.6.1.1]

50.6.1.1 *

Cooking equipment shall ~~be approved~~ be approved based on one of the following criteria:

(1) Listings by a testing laboratory for mobile applications and for the appropriate fuel.

(2) Test data acceptable to the AHJ [**96:**12.1.1]

Statement of Problem and Substantiation for Public Comment

Cooking equipment should be listed for use in a mobile food vehicle to provide appropriate safety.

Related Item

First Revision No. 98-NFPA 1-2015 [New Section after 50.6.3]

Submitter Information Verification

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Public Comment No. 42-NFPA 1-2016 [Section No. 50.6.1.2.4]

50.6.1.2.4

All deep-fat fryers shall be installed with at least a 16 in. (406 mm) space between the fryer and surface flames from adjacent cooking equipment. [**96:**12.1.2.4]

50.6.1.2.4.1 All fat fryers shall have a lid over the oil vat that can be secured in order to prevent the spillage of cooking oil during transit. This lid shall be secured at all times when the vehicle is in motion.

Statement of Problem and Substantiation for Public Comment

This is an important safety feature that should be provided.

Related Item

First Revision No. 98-NFPA 1-2015 [New Section after 50.6.3]

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Public Comment No. 46-NFPA 1-2016 [New Section after 50.6.1.2.5.1]

TITLE OF NEW CONTENT

50.6.1.2.6 The main system shutoff valves located on or closest to the fuel tanks and sufficient to stop the supply of fuel from all fuel tanks must be clearly marked with the words "MAIN FUEL SHUTOFF VALVE" permanently affixed to the outside of the vehicle in reflective decal material with letters a minimum of 2" high. The valve shall be located no less than 20" above the top of the bumper of the vehicle.

Statement of Problem and Substantiation for Public Comment

Clearly identified location and access to the main shut-off valve is important during emergency situations.

Related Item

First Revision No. 98-NFPA 1-2015 [New Section after 50.6.3]

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Public Comment No. 37-NFPA 1-2016 [Section No. 50.7.1.4.3]

50.7.1.4.3

When wood or charcoal is used, a minimum of one 2A portable fire ~~extinguisher or an approved hose line shall~~ extinguisher shall be provided.

Statement of Problem and Substantiation for Public Comment

Committee members raised concern on what an approved hose line is. The intent was to permit a garden hose if approved by the ahj. By removing the hose line requirement the ahj can still accept a garden hose under 1.4.

Related Item

First Revision No. 98-NFPA 1-2015 [New Section after 50.6.3]

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Public Comment No. 66-NFPA 1-2016 [Section No. 50.7.1.4.3]

50.7.1.4.3

When wood or charcoal is used, a minimum of one 2A portable fire extinguisher ~~or an approved hose line~~ shall be provided.

Statement of Problem and Substantiation for Public Comment

The BCDC agrees with negative comments that indicate the approved hose line is undefined. This could be interpreted to mean a garden hose.

Related Item

First Revision No. 98-NFPA 1-2015 [New Section after 50.6.3]

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Public Comment No. 70-NFPA 1-2016 [Section No. 50.7.1.5]

50.7.1.5 Separation.

Mobile or temporary cooking operations shall be separated from buildings or structures, combustible materials, vehicles, and other cooking operations by a minimum of 10 ft (3 m).

50.7.1.5.1. Separation between mobile cooking vehicles shall be permitted to be reduced to 3 ft when such vehicles are parked in parallel parking type arrangements.

Statement of Problem and Substantiation for Public Comment

When parked in parallel type parking arrangements, it is unreasonable to create 10 ft of minimum separation between vehicles. In order to accomplish the 10 ft separation, a vacant parking space would need to be required between each vehicle. This is unrealistic in most urban centers. Providing a 3 ft separation between vehicles in a bumper to bumper arrangement permits enough room for the movement of pedestrians and some exposure protection from vehicle to vehicle.

Related Item

Public Input No. 19-NFPA 1-2015 [Section No. 13.7.4.4]

First Revision No. 98-NFPA 1-2015 [New Section after 50.6.3]

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Public Comment No. 47-NFPA 1-2016 [New Section after 50.7.1.11.2]

TITLE OF NEW CONTENT

5.7.1.12 Flammable liquids shall not be stored inside mobile cooking vehicle or in temporary cooking areas unless stored in accordance with NFPA 30.

Statement of Problem and Substantiation for Public Comment

Safe storage of flammable liquids should be in accordance with NFPA 30.

Related Item

First Revision No. 98-NFPA 1-2015 [New Section after 50.6.3]

Submitter Information Verification

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Public Comment No. 44-NFPA 1-2016 [Section No. 50.7.2.1]

50.7.2.1 General.

Mobile cooking operations and equipment shall comply with 50.7.1 and 50.7.2 ~~of NFPA~~ and NFPA 96.

Statement of Problem and Substantiation for Public Comment

There is no Section 50.7.1 or 50.7.2 in NFPA 96. It is believed the technical committee is talking about compliance with Sections 50.7.1 and 50.7.2 from NFPA 1 as well as NFPA 96.

Related Item

First Revision No. 98-NFPA 1-2015 [New Section after 50.6.3]

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Submittal Date: Thu Apr 28 12:24:03 EDT 2016

Public Comment No. 30-NFPA 1-2016 [Section No. 50.7.2.3]

50.7.2.3 Leak Detection.

50.7.2.3.1

Gas systems shall be inspected prior to each use by a worker trained in accordance with 50.7.1.8.

50.7.2.3.2

Leak detection testing ~~shall~~ , in accordance with 50.7.2.3.4, shall be documented and made available to the AHJ on request.

50.7.2.3.3

Where a gas detection system has been installed, it shall be tested every month.

50.7.2.3.4 –

~~Leak detection shall be performed every time a new connection or a change in a cylinder is made to any gas system.~~

LP Gas systems on mobile food service vehicles shall be certified for compliance with NFPA 58, Liquefied Petroleum Gas Code, by an approved company with expertise in the installation, inspection and maintenance of LP gas systems.

50.7.2.3.4.1

The certification shall be good for one (1) year.

50.7.2.3.4.2

Recertification shall occur every time an appliance is replaced or added and if a piping connection is modified in anyway.

50.7.2.3.4.2.1

A change in cylinder shall not be considered a piping connection modification.

50.7.2.3.4.3

The certification documentation shall consist of:

1. The name of the certification company and;

2. The license number, certificate of fitness number of other applicable identifying number that demonstrates the certification company is approved to install, inspect and maintain LP gas systems and;

3. The corporate name of mobile food service business and;

4. The identifying name on the side of the mobile food vehicle and;

5. Date of inspection and;

7. Vehicle tag number and VIN and;

8. A signed statement by the agent for the certification company stating: The LP Gas system has been inspected for compliance with the current edition of NFPA 58, Liquefied Petroleum Gas Code, and found to be in compliance with the provisions of the code. In addition, leak detection has been conducted on the LP Gas system piping and the piping has been found to maintain integrity.

50.7.2.3.4.4

Mobile food service vehicles equipped with an LP gas system, but without a current approved LP gas certification, shall not be permitted to be operated for mobile food service.

Statement of Problem and Substantiation for Public Comment

The current language in 50.7.2.3 that was accepted as part of FR 98, refers to "Leak Detection." Unfortunately, there is no definition for what is acceptable in meeting the "leak detection" requirement. One AHJ may require simple pressurization and smell for LP gas, another may run a meter through the vehicle, another may want to soap all of the joints and still another may require a full pressure test with an inert gas. The attached Public Comment raises the concern about the lack of guidance as to what qualifies as "leak detection" and attempts to solve the issue by requiring these system be certified annually by a company with expertise in LP gas system. The proposed certification process for the LP system will provide the owner and AHJ with a confidence level that the LP gas system is safe for operation.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 19-NFPA 1-2016 [New Section after A.50.6.1.2.2]	This PC is related to the same concern but utilizes a different approach to address the issue.

Related Item

First Revision No. 98-NFPA 1-2015 [New Section after 50.6.3]

Submitter Information Verification

Submitter Full Name: Anthony Apfelbeck
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Submittal Date: Tue Mar 29 09:41:14 EDT 2016

Public Comment No. 38-NFPA 1-2016 [Section No. 50.7.2.3.2]

50.7.2.3.2

A soap and water leak detection test shall be performed anytime a new connection is made or when a tank is replaced.

50.7.2.3.2.1

Leak detection testing shall be documented and made available to the AHJ on request.

Statement of Problem and Substantiation for Public Comment

Clarifies that the leak test is a soap and water leak test.

Related Item

First Revision No. 98-NFPA 1-2015 [New Section after 50.6.3]

Submitter Information Verification

Submitter Full Name: Bill Galloway
Organization: West Florence Fire Rescue
Affilliation: IFMA Board
Street Address:
City:
State:
Zip:
Submittal Date: Fri Apr 22 15:14:29 EDT 2016

Public Comment No. 45-NFPA 1-2016 [New Section after 50.7.2.4.3.4(I)]

TITLE OF NEW CONTENT

(J) The mounting of LP-gas containers must withstand impact equal to four times the weight of the filled LP-gas container.

[or we can extract from NFPA 58, Section 6.24.3.24(B)]

Statement of Problem and Substantiation for Public Comment

This is important information that might be missed if the user is forced to refer back to NFPA 58.

Related Item

First Revision No. 98-NFPA 1-2015 [New Section after 50.6.3]

Submitter Information Verification

Submitter Full Name: Catherine Stashak
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Submittal Date: Thu Apr 28 12:28:40 EDT 2016

Public Comment No. 85-NFPA 1-2016 [Chapter 52]

~~52.2.1~~ ~~–~~

Chapter 52

~~Stationary~~

Energy Storage

~~Battery~~

Systems

52.1 *****

~~–~~

General

~~.~~

~~Stationary storage battery systems having an electrolyte capacity of more than 100 gal (378.5 L) in sprinklered buildings or 50 gal (189.3 L) in unsprinklered buildings for flooded lead-acid, nickel-cadmium, and valve-regulated lead–acid (VRLA) batteries or 1000 lb (454 kg) for lithium-ion and lithium metal polymer batteries used for facility standby power, emergency power, or uninterrupted power supplies shall be in accordance with Chapter~~ ~~52~~ ~~and~~ ~~Table 52.1~~ ~~.~~

~~Table 52.1 Battery Requirements~~

~~Nonrecombinant Batteries Recombinant Batteries Other Requirement Flooded Lead-Acid Flooded Nickel-Cadmium (Ni-Cd) Valve-Regulated Lead–Acid (VRLA) Lithium-Ion Lithium Metal Polymer Safety caps Venting caps Venting caps Self-resealing flame-arresting caps No caps No caps Thermal runaway management Not required Not required Required Not required Required Spill control Required Required Not required Not required Not required Neutralization Required Required Required Not required Not required Ventilation Required Required Required Not required Not required Signage Required Required Required Required Required Seismic control Required Required Required Required Required Fire detection Required Required Required Required Required~~

~~52.2~~ ~~–~~ ~~Permits.~~

~~52.3.3.2 –~~

~~Battery~~

52.1.1 Energy storage systems having a capacity greater than the quantities listed in Table 52.1 shall be in accordance with Chapter 52 and where used as a legally

required emergency or standby power system, shall also comply with 11.7.3

Table 52.1

ENERGY STORAGE SYSTEM THRESHOLD QUANTITIES

TYPE	CAPACITY [a]
Lead acid batteries, all types	70 KWh (25.2 Mega joules)
Nickel cadmium batteries	70 KWh (18.0 Mega joules)
Lithium batteries, all types	20 KWh(18.0 Mega joules)
Sodium batteries, all types	20 KWh (18.0 Mega joules) [c]
Flow batteries [b]	20 KWh (18.0 Mega joules)
Other battery technologies	10 KWh (10.8 Mega joules)
Capacitors	70 KWh (25.2 Mega joules)

a – For batteries and capacitors rated in Amp-Hours, KWh shall equal rated voltage times amp-hour rating divided by 1000

b – Shall include vanadium, zinc-bromine, polysulfide-bromide, and other flowing electrolyte type technologies

c – 70 KWh (25.2 Mega joules) for sodium-ion technologies

A.52.1 The requirements in Chapter 52 supersede all the hazardous material designations, permits, and requirements in Chapter 60.

52.1.2 Permits.

52.1.2.1 Permits, where required, shall comply with Section 1.12 .

52. 1. 2.2

–

Prior to installation, plans shall be submitted and approved by the AHJ.

52.

~~3 Safety Features.~~

~~52.3.1 – Safety Venting.~~

~~Batteries shall be provided with safety venting caps as follows in 52.3.1.1 through 52.3.1.3 .~~

~~52.3.1.1 – Nonrecombinant Batteries.~~

~~Vented lead-acid, nickel-cadmium, or other types of nonrecombinant batteries shall be provided with safety venting caps.~~

~~52.3.1.2 – Recombinant Batteries.~~

~~VRLA or other types of sealed, recombinant batteries shall be equipped with self-resealing flame-arresting safety vents.~~

~~52.3.1.3 –~~

~~Lithium-ion and lithium metal polymer batteries shall not require safety venting caps.~~

~~52.3.2 – Thermal Runaway.~~

~~VRLA, lithium-ion, and lithium metal polymer battery systems shall be provided with a listed device or other approved method to preclude, detect, and control thermal runaway.~~

~~52.3.3 – Location and Occupancy Separation.~~

~~52.3.3.1 –~~

~~Battery systems shall be permitted in the same room as the equipment that they support.~~

~~For flooded lead-acid, flooded nickel-cadmium, and VRLA batteries, ventilation shall be provided~~

2* Stationary Storage Battery Systems

A.52.2 This section covers stationary battery systems that are typically used for facility standby power, emergency power, uninterrupted power supplies or load shedding/load balancing applications.

Stationary storage battery systems that exceed the amounts specified in Table 52.1 pose potential hazards that are significant enough to require compliance with the requirements in this chapter. It is not the intent of this chapter to regulate equipment with integral standby power systems below the amounts in this table, such as emergency lighting units, fire alarm control units, and other appliances and equipment.

52.2.1 Location and Occupancy Separation . Stationary storage battery systems shall be located and constructed in accordance with this section.

52.2.1.1 Stationary storage battery systems shall be housed in a noncombustible, locked cabinet or other enclosure to prevent access by unauthorized personnel unless located in a separate equipment room accessible only to authorized personnel.

52. 2.1.2 Location. Stationary storage battery systems shall not be located in areas where the floor is located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access, or where the floor level is more than 30 feet (9144 mm) below the finished floor of the lowest level of exit discharge.

Exceptions:

(1) Lead acid and nickel cadmium stationary storage battery systems.

(2) Installations on noncombustible rooftops of buildings exceeding 75 feet (22 860 mm) in height that do not obstruct fire department rooftop operations shall be permitted when approved by the AHJ.

52.2.1. 3 **Separation:** Rooms containing stationary storage battery systems shall be located in high hazard occupancies, or shall be separated from other areas of the building as follows .

~~3.3 –~~
Stationary storage battery systems shall be allowed to be in the same room with the equipment they support.

52.2.1.3.1 In other than assembly, educational, detention and correction facilities, health care, ambulatory health care, day care centers, residential board and care, and residential occupancies, stationary storage battery systems shall be located in a room separated from other portions of the building by a minimum of a 1-hour fire barrier.

52.

~~3~~
2 . 1. 3.

~~4 –~~
2 In assembly, educational, detention and correction facilities, health care, ambulatory health care, day care centers, residential board and care, and residential occupancies, stationary storage battery systems shall be located in a room separated from other portions of the building by a minimum of a 2-hour fire barrier.

52.

~~3~~
2 .

~~4 – Spill Control.~~

~~52.3.4.1 –~~

~~Rooms, buildings, or areas containing free-flowing liquid electrolyte in individual vessels having a capacity of more than 55 gal (208 L) or multiple vessels having an aggregate capacity exceeding 1000 gal (3785 L) shall be provided with spill control to prevent the flow of liquids to adjoining areas.~~

52.3.4.2 * - –

An approved method and materials for the control of a spill of electrolyte shall be provided that will be capable of controlling a spill from the single largest vessel.

52.3.4.3 –

VRLA, lithium-ion, lithium metal polymer, or other types of sealed batteries with immobilized electrolyte shall not require spill control.

52.3.5 – Neutralization.

52.3.5.1 * - –

An approved method to neutralize spilled electrolyte shall be provided.

52.3.5.2 –

For nonrecombinant batteries and VRLA batteries, the method shall be capable of neutralizing a spill from the largest battery to a pH between 7.0 and 9.0.

52.3.5.3 –

Lithium-ion and lithium metal polymer batteries shall not require neutralization.

52.3.6 * - – Ventilation.

1.4 Outdoor installations. Stationary storage battery systems located outdoors shall comply with this Section, in addition to all applicable requirements of Chapter 52. Installations in outdoor enclosures or containers which are occupied for servicing, testing, maintenance and other functions shall be treated as stationary storage battery system rooms.

Exception: Battery arrays in noncombustible containers shall not be required to be spaced three feet (914 mm) from the container walls.

52.2.1.4.1 Separation. Stationary storage battery systems located outdoors shall be separated by a minimum five feet (1524 mm) from the following:

Lot lines

Public ways

Buildings

Stored combustible materials

Hazardous materials

High-piled stock

Other exposure hazards

Exception: The AHJ is authorized to approve smaller separation distances if large scale fire and fault condition testing conducted or witnessed and reported by an approved testing laboratory is provided showing that a fire involving the system will not adversely impact occupant egress from adjacent buildings, or adversely impact adjacent stored materials or structures.

52.2.1.4.2 Means of egress. Stationary storage battery systems located outdoors shall be separated from any means of egress as required by the AHJ to ensure safe egress under fire conditions, but in no case less than 10 feet (3048 mm). The AHJ is authorized to approve smaller separation distances if large scale fire and fault condition testing conducted or witnessed and reported by an approved testing laboratory is provided showing that a fire involving the system will not adversely impact occupant egress.

52.2.1.4.3 Security of areas. Outdoor areas in which stationary storage battery systems are located shall be secured against unauthorized entry in an approved manner.

52.2.2 Maximum Allowable Quantities. Fire areas within buildings containing stationary storage battery systems exceeding the maximum allowable quantities in Table 52.2.2 shall comply with all applicable Ordinary Hazard and High Hazard requirements as identified in NFPA 101.6.2.2 and the building code. Where approved by the AHJ, areas containing stationary storage battery systems that exceed the amounts in Table 52.2.2 shall be permitted to be treated as ordinary hazard and not a high hazard classification based on a hazardous mitigation analysis in accordance with 52.2.4 and large scale fire and fault condition testing conducted or witnessed and reported by an approved testing laboratory.

TABLE 52.2.2

MAXIMUM ALLOWABLE QUANTITIES

TYPE	MAXIMUM ALLOWABLE QUANTITIES [a]	Hazard Classification
Lead acid batteries, all types	Unlimited	Ordinary hazard
Nickel cadmium batteries	Unlimited	Ordinary hazard
Lithium batteries, all types	600KWh	High hazard [c]
Sodium batteries , all types	600KWh	High hazard [c]
Flow batteries [b]	600KWh	High hazard [c]
Other battery technologies	200 KWh	High hazard [c]

a – For batteries rated in Amp-Hours, KWh shall equal rated voltage times amp-hour rating divided by

1000x

b – Shall include vanadium, zinc-bromine, polysulfide-bromide, and other flowing electrolyte type technologies

c - Shall be permitted to be ordinary hazard classification if approved by the AHJ based on (1) a hazard mitigation analysis conducted in accordance with Section 52.2.4 and (2) large scale fire and fault condition testing conducted or witnessed and reported by an approved testing laboratory that shows that a fire involving the stationary storage battery system is contained within the room for a duration equal to the fire resistance rating of the room separation required in Sections 52.2.1.3.1 or 52.2.1.3.2, as applicable.

52.2.2.1 Mixed energy systems. When areas within buildings contain a combination of energy system technologies, the total aggregate quantities shall be determined based on the sum of percentages of each type divided by the maximum allowable quantity of each type. If the sum of the percentages exceeds 100%, the area shall be treated as a high hazard classification in accordance with Table 52.1.4.

52.2.3* Battery Arrays: Storage batteries, prepackaged stationary storage battery systems and pre-engineered stationary storage battery systems shall be segregated into arrays not exceeding 50 KWh (180 Mega joules) each. Each array shall be spaced a minimum three feet (914 mm) from other arrays and from walls in the storage room or area. The storage arrangements shall comply with the egress provisions in NFPA 101.

Exceptions:

(1) Lead acid and nickel cadmium storage battery arrays have no size limitations.

(1) Listed pre-engineered stationary storage battery systems and prepackaged stationary storage battery systems shall not exceed 250 KWh (900 Mega joules) each.

(2) The AHJ is authorized to approve listed pre-engineered and prepackaged battery arrays with larger capacities or smaller battery array spacing if large scale fire and fault condition testing conducted or witnessed and reported by an approved testing laboratory is provided showing that a fire involving one array will not propagate to an adjacent array, and be contained within the room for a duration equal to the fire resistance rating of the room separation required by Section 52.1.3.3.

A.52.2.3 A stationary battery array is an arrangement of individual stationary storage batteries in close proximity to each other, mounted on storage racks or in modules, battery cabinets or other enclosures.

52.2.4 Hazard Mitigation Analysis. A failure mode and effects analysis (FMEA) or other approved hazard mitigation analysis shall be provided to the AHJ when any of the following conditions are present.

(1) Battery technologies not specifically identified in Table 52.1 are provided.

(2) More than one stationary storage battery technology is provided in a room or indoor area where there is a potential for adverse interaction between technologies.

(3) When allowed as a basis for increasing maximum allowable quantities as specified in Table 52.2.2.

52.2.4.1 The analysis shall evaluate the consequences of the following failure modes, and others deemed necessary by the AHJ. Only single failure modes shall be considered for each mode.

(1) Thermal runaway condition in a single module or array.

(2) Failure of a battery management system.

(3) Failure of a required ventilation system.

(4) Voltage surges on the primary electric supply.

(5) Short circuits on the load side of the stationary battery storage system.

(6) Failure of the smoke detection, fire suppression, or gas detection system.

52.2.4.2 Analysis approval . The AHJ is authorized to approve the hazardous mitigation analysis provided the consequences of the FMEA demonstrate:

(1) Fires or explosions will be contained within unoccupied stationary storage battery system rooms for the minimum duration of the fire resistance rated specified in Section 52.2.1.3.1 or 52.2.1.3.2, as applicable.

(2) Fires and explosions in stationary storage battery system cabinets in occupied work centers allow occupants to safely evacuate.

(3) Toxic and highly toxic gases released during charging, discharging and normal operation shall not exceed the permissible exposure limit (PEL).

(4) Toxic and highly toxic gases released during fires and other fault conditions shall not reach concentrations in access of IDLH level in the building or adjacent means of egress routes during the time deemed necessary to evacuate from that area.

(5) Flammable gases released from batteries during charging, discharging and normal operation shall not exceed 25% of the lower flammable limit (LFL).

52.2.4.3 Construction, equipment and systems that are required for the stationary storage battery system to comply with the hazardous mitigation analysis shall be installed, maintained and tested in accordance with nationally recognized standards and specified design parameters.

52.2.5 Listings. Storage batteries shall be listed in accordance with UL 1973. Prepackaged and pre-engineered stationary storage battery systems shall be listed in accordance with UL 9540.

Exception: Lead-acid batteries are not required to be listed.

52.2.5.1 Prepackaged and pre-engineered systems . Prepackaged and pre-engineered stationary storage battery systems shall be installed in accordance with their listing and the manufacturer's instructions.

A.52.2.5 A prepackaged stationary storage battery system is designed and investigated as a single unit, assembled in a factory, and shipped to the site. A pre-engineered stationary storage battery system is designed and investigated as a single unit, but is shipped in modular form for assembly at the site.

52.2.5.2 Environment. The storage battery environment shall be controlled to maintain temperatures and conditions within the battery manufacturer's specifications.

52.2.6 Installation

52.2.6.1 Battery Management System. An approved battery management system shall be provided for battery technologies other than lead acid and nickel cadmium for monitoring and balancing cell voltages, currents and temperatures within the manufacturer's specifications. The system shall transmit an alarm signal to an approved location if potentially hazardous temperatures or other conditions including short circuits, overvoltage (overcharge) or under voltage (over discharge) are detected.

52.2.6.2 Battery chargers. Battery chargers shall be compatible with the battery manufacturer's electrical ratings and charging specifications. Battery chargers shall be listed in accordance with the UL 1564 or provided as part of a listed pre-engineered or prepackaged stationary storage battery system.

52.2.6.3 Vehicle impact protection. Vehicle impact protection shall be provided where stationary storage battery systems are subject to impact by motor vehicles.

52.2.6.4 Combustible storage. Combustible materials not related to the stationary storage battery system shall not be stored in battery rooms, cabinets or enclosures. Combustible materials in occupied work centers shall comply with Section 10.18 and shall not be stored within 3 feet (915 mm) from battery cabinets.

52.2.6.5 Signage. Approved signage shall be provided on doors or in approved locations near entrances to stationary battery storage system rooms. Existing stationary storage battery systems shall be permitted to include the signage required at the time it was installed. New installations shall require the following items.

(1) Hazard identification markings in accordance with NFPA 704.

(2) "This room contains energized battery systems", or the equivalent.

(3) Identification of the type(s) of batteries present

(4) AUTHORIZED PERSONNEL ONLY

(5) Technology specific markings, if required in 52.2.11

(6) Where the battery storage system disconnecting means is not within sight of the Main Service disconnect, placards or directories shall be installed at the locations of the Main Service disconnect to indicate the location of all battery storage disconnecting means in accordance with NFPA 70.

52.2.6.5.1 Battery cabinets shall be provided with exterior labels that identify the manufacturer and model number of the system and electrical rating (voltage and current) of the contained battery system.

52.2.6.5.2 Signs shall be provided within battery cabinets to indicate the relevant electrical, chemical, and

fire hazard.

52.2.6.5.3 Fire Command Centers . Fire command centers in buildings containing stationary storage battery systems shall include signage, or readily available documentation, that describes the location of stationary storage battery systems, the types of batteries present, operating voltages, and location of electrical disconnects.

52.2.6.6 Seismic Protection. In seismically active areas, battery systems shall be seismically braced in accordance with the building code.

52.2.6.7 Safety Caps. Vented batteries shall be provided with flame-arresting safety caps.

52.2.6.8* Mixed Battery Systems. Different types of batteries shall not be installed in the same room or cabinet if there is a potential for unsafe interaction between them, as determined by the AHJ.

A.52.2.6.8 This section is intended to address unique situations where the installation of different types of batteries in the same room or cabinet may create a situation where there is unacceptable chemical, thermal or other interaction between them, or where the surrounding environment is not within the battery manufacturers' specifications. The AHJ has the option to require a hazard mitigation analysis, conducted in accordance with Section 52.2.4, to identify hazards and potential solutions that will mitigate the hazards.

52.2.7 Suppression and Detection.

52.2.7.1 Fire suppression. Rooms containing stationary storage battery systems shall be protected by an automatic sprinkler system installed in accordance with NFPA 13. Commodity classifications for specific technologies of storage batteries shall be in accordance with Chapter 5 of NFPA 13. If the storage battery types are not specifically addressed in Chapter 5 of NFPA 13, the AHJ shall be permitted to approve the fire suppression system based on full scale fire and fault condition testing conducted or witnessed and reported by an approved laboratory.

Exception: Automatic sprinkler systems shall not be required in spaces or areas containing lead acid stationary storage battery systems used exclusively for telecommunications equipment purposes.

52.2.7.2 Smoke detection. An approved automatic smoke detection system shall be installed in rooms containing stationary battery storage systems in accordance with

NFPA 72.

52.2.8* Ventilation. Where required by Section 52.2.11, ventilation shall be provided

for rooms and cabinets in accordance with the mechanical code and one of the following:

(1) The ventilation system shall be designed to limit the maximum concentration of

~~hydrogen to 1.0 percent of the~~

flammable gas to 25% of the lower flammable limit (LFL) of the total volume of the room during the worst-case event of simultaneous "boost" charging of all the batteries, in accordance with nationally recognized standards.

~~Continuous~~

(2) Mechanical ventilation shall be provided at a rate of not less than 1

~~ft~~ ^{3}

ft3 /min/

~~ft~~ ^{2}

ft2 (5.1 L/sec/

~~m~~ ^{2}

m2) of floor area of the room or cabinet. The ventilation can be either continuous, or activated by a gas detection system in accordance with Section 52.2.8.2.

A. 52.

~~3.6.1~~

~~Lithium-ion and lithium metal polymer batteries shall not require ventilation.~~

52.3.7 – Environment.

The battery environment shall be controlled or analyzed to maintain temperature in a safe operating range for the specific battery technology used.

52.3.8 – Signs.

52.3.8.1 –

Doors or accesses into the following shall be provided with approved signs:

(1) - Battery storage buildings

(2) - Rooms containing stationary storage battery systems

(3) - Other areas containing stationary storage battery systems

52.3.8.2 –

For rooms that contain Valve-Regulated Lead–Acid (VRLA), Lithium-Ion, or Lithium Metal Polymer batteries, the signs required by 52.3.8.1 shall state the following:

This room contains:

(1) - Stationary storage battery systems

(2) - Energized electrical circuits

52.3.8.3 –

For rooms that contain Flooded Lead-Acid or Flooded Nickel-Cadmium (Ni-Cd) batteries, the signs required by 52.3.8.1 shall state the following:

This room contains:

(1) - Stationary storage battery systems

(2) - Energized electrical circuits

(3) - Corrosive battery electrolyte

~~52.3.8.4 –~~

~~Battery~~

2.8 Information on battery room ventilation can be found in IEEE 1635/ASHRAE 21, Guide to Battery Room Ventilation and Thermal Management.

52.2.8.1 Required mechanical ventilation systems for rooms and cabinets containing storage batteries shall be supervised for by an approved central station, proprietary or remote station service or shall initiate an audible and visual signal at an approved constantly attended on-site location.

52.2.8.2 Where required by Section 52.2.8 (2) rooms containing stationary storage battery systems shall be protected by an approved continuous gas detection system. The gas detection system shall be designed to activate when the level of flammable gas exceeds 25 percent of the lower flammable limit (LFL). Activation of the gas detection system shall result in activate of the mechanical ventilation system which shall remain on until the flammable gas detected is less than 25% of the LFL. The gas detection system shall include a minimum two hours of standby power. Failure of the gas detection system shall annunciate a trouble signal at an approved central station, proprietary or remote station service, or when approved at a constantly attended onsite location.

52.2.9* Spill control and neutralization. Where required by Section 52.2.11, approved methods and materials shall be provided for the control and neutralization of spills of electrolyte or other hazardous materials in rooms containing stationary storage batteries as follows:

1. For batteries with free flowing electrolyte, the method and materials shall be capable of neutralizing a spill of the total capacity from the largest cell or block to a pH between 5.0 and 9.0.

2. For batteries with immobilized electrolyte, the method and materials shall be capable of neutralizing a spill of 3.0 percent of the capacity of the largest cell or block in the room to a pH between 5.0 and 9.0.

A.52.2.9 Methods of achieving this protection can include, but are not limited to, the following:

(1) Liquid tight sloped or recessed floors in indoor locations or similar areas in outdoor locations

(2) Liquid tight floors in indoor locations or similar areas in outdoor locations provided with liquid tight raised or recessed sills or dikes

(3) Sumps and collection systems

52.2.10 Thermal Runaway. Where required by Section 52.2.11, a listed device or other approved method shall be provided to preclude, detect, and control thermal runaway.

52.2.11 Battery Specific Protection Stationary storage battery systems shall comply with the Sections 52.2 through 52.2.10 and this section, as applicable.

52.2.11.1 Lead Acid Batteries. Stationary storage battery systems utilizing lead acid batteries shall comply with the following:

1. Ventilation shall be provided in accordance with Section 52.2.8.

2. Spill control and neutralization shall be in accordance with Section 52.2.9.

3. Thermal runaway protection shall be provided for VRLA storage batteries in accordance with Section 52.2.10.

52.2.11.2 Nickel Cadmium Batteries. Stationary storage battery systems utilizing lead acid batteries shall comply with the following:

1. Ventilation shall be provided in accordance with Section 52.2.8.

2. Spill control and neutralization shall be in accordance with Section 52.2.9.

3. Thermal runaway protection shall be provided in accordance with Section 52.2.10.

52.2.11.3 Lithium Batteries . Stationary storage battery systems utilizing lithium batteries shall comply with the following:

1. Thermal runaway protection shall be provided in accordance with Section 52.2.10.

52.2.11.4 Sodium Batteries. Stationary storage battery systems utilizing sodium batteries shall comply with the following:

1. Ventilation shall be provided in accordance with Section 52.2.8.

2. Spill control and neutralization shall be in accordance with Section 52.2.9.

3. Thermal runaway protection shall be provided for in accordance with Section 52.2.10.

4. A hazard mitigation analysis shall be provided for systems that utilize sodium sulfur batteries, or other sulfur type battery systems that operate above ambient temperatures.

5. The signage required in Section 52.2.6.5 shall include, when applicable, “Water Reactive Hazard – Apply No Water”.

52.2.11.5 Flow batteries. Stationary storage battery systems utilizing flow batteries shall comply with the following:

1. Ventilation shall be provided in accordance with Section 52.2.8.

2. Spill control and neutralization shall be in accordance with Section 52.2.9.

52.2.11.6 Other Battery Types. Stationary storage battery systems utilizing battery technologies other than those described above shall comply with the following:

1. Ventilation shall be provided in accordance with Section 52.2.8 when flammable, toxic or highly toxic gases may be present during charging, discharging and normal system use.

2. Spill control and neutralization shall be in accordance with Section 52.2.9 when the batteries contain electrolytes that may be released from the batteries.

3. Thermal runaway protection shall be provided in accordance with Section 52.2.10.

4. The signage required in Section 52.2.6.5 shall also identify any potential hazards associated with the batteries.

52.2.12 Testing, Maintenance and Repairs. Stationary storage batteries and associated equipment and systems shall be tested and maintained in accordance with the manufacturer’s instructions. Any storage batteries or system components used to replace existing units shall be compatible with the battery charger, battery management systems, other storage batteries, and other safety systems.

52.3 Capacitor Energy Storage Systems.

52.3.1 Stationary capacitor energy storage systems having capacities greater than those described in Table 52.1 shall comply with this Section.

52.3.2 Location and Occupancy Separation. Stationary capacitor energy storage systems shall be located and constructed as required for stationary storage battery system in accordance with Section 52.2.1 through 52.2.1.4.3.

52.3.3 Maximum Allowable Quantities. Fire areas within buildings containing capacitor energy storage systems exceeding 600 KWh shall comply with all applicable Ordinary Hazard and High Hazard requirements as identified in NFPA 101.6.2.2 and the building code.

52.3.4 Capacitor Arrays: Capacitors, prepackaged stationary capacitor energy storage systems, and pre-engineered capacitor energy storage systems shall be segregated into arrays not exceeding 50 KWh (180 Mega joules) each. Each array shall be spaced a minimum three feet (914 mm) from other arrays and from walls in the storage room or area. The storage arrangements shall comply with the egress provisions in NFPA 101.

52.3.5 Listings. Capacitors shall be listed in accordance with UL 1973. Prepackaged and pre-engineered capacitor energy systems shall be listed in accordance with UL 9540.

52.3.5.1 Prepackaged and pre-engineered systems . Prepackaged and pre-engineered capacitor energy storage systems shall be installed in accordance with their listing and the manufacturer’s instructions.

A.52.3.5 A prepackaged capacitor energy system is designed and investigated as a single unit, assembled in a factory, and shipped to the site. A pre-engineered capacitor energy system is designed and investigated as a single unit, but is shipped in modular form for assembly at the site.

52.3.5.2 Environment. The environment surrounding the capacitors shall be controlled to maintain temperatures and conditions within the manufacturer’s specifications.

52.3.6 Chargers. Capacitor chargers shall be compatible with the capacitor manufacturer’s electrical ratings and charging specifications, and shall be listed in accordance with the UL 1564 or provided as part of a listed pre-engineered or prepackaged capacitor energy storage system.

52.3.7 Vehicle impact protection. Vehicle impact protection shall be provided where capacitor energy storage systems are subject to impact by motor vehicles.

52.3.8 Combustible storage. Combustible materials not related to the capacitor energy storage system shall not be stored in capacitor rooms, cabinets or enclosures. Combustible materials in occupied work centers shall comply with Section 10.18 and shall not be stored within 3 feet (915 mm) from capacitor

cabinets.

52.3.9 Signage. Approved signage shall be provided on doors or in approved locations near entrances to capacitor energy storage systems, and shall include the following:

(1) Hazard identification markings in accordance with NFPA 704.

(2) "This room contains energized capacitor systems", or the equivalent

(3) Identification of the type(s) of capacitors present

(4) AUTHORIZED PERSONNEL ONLY

(5) Where the capacitor energy storage system disconnecting means is not within sight of the Main Service disconnect, placards or directories shall be installed at the locations of the Main Service disconnect to indicate the location of all capacitor energy storage system disconnecting means in accordance with NFPA 70.

52.3.9.1 Capacitor cabinets shall be provided with exterior labels that identify the manufacturer and model number of the system and electrical rating (voltage and current) of the contained battery system.

~~52.3.8.5 – Signs shall be provided within battery capacitor cabinets to indicate the relevant electrical, chemical, and fire hazard.~~

~~**52.3.9 .2 Fire Command Centers** . Fire command centers in buildings containing capacitor energy storage systems shall include signage, or readily available documentation, that describes the location of the systems, the types of capacitors present, operating voltages, and location of electrical disconnects.~~

~~**52.3.10 Seismic Protection.** In seismically active areas, battery capacitor energy storage systems shall be seismically braced in accordance with the building code.~~

~~**52.3.** 10 Smoke Detection.~~

~~An approved automatic smoke detection system shall be installed in such areas and supervised by an approved central, proprietary, or remote station service or a local alarm that will give an audible signal at a constantly attended location~~

~~**11 Testing, Maintenance and Repairs.** Capacitor energy storage systems and associated equipment and systems shall be tested and maintained in accordance with the manufacturer's instructions. Any capacitors or system components used to replace existing units shall be compatible with the capacitor charger, other capacitors, and other safety systems .~~

Additional Proposed Changes

File Name	Description	Approved
Final_NFPA_1_Chapter_52_rewrite_5-13-16.for_first_draft_public_comment_for_CI_137docx.docx	Chapter 52 rewrite	

Statement of Problem and Substantiation for Public Comment

The First Draft proposal was a rough outline to rewrite Chapter 52 and up date it with technologies that are relevant today. The committee created an in put #137 relevant to a number of individual changes that were submitted for their review. This public comment replaces the First Draft proposal and provides a working document that the committee can review and adopt.

Related Item

Committee Input No. 137-NFPA 1-2015 [Chapter 52]
Public Input No. 279-NFPA 1-2015 [New Section after 52.1]
Public Input No. 270-NFPA 1-2015 [New Section after 52.1]
Public Input No. 271-NFPA 1-2015 [New Section after 52.1]
Public Input No. 269-NFPA 1-2015 [Section No. 2.3.17]
Public Input No. 269-NFPA 1-2015 [Section No. 2.3.17]
Public Input No. 289-NFPA 1-2015 [Section No. A.52.3.6]
Public Input No. 267-NFPA 1-2015 [Section No. A.52.1]
Public Input No. 285-NFPA 1-2015 [Section No. 52.3.5]
Public Input No. 281-NFPA 1-2015 [Section No. 52.3.1]
Public Input No. 287-NFPA 1-2015 [Section No. 52.3.6]
Public Input No. 250-NFPA 1-2015 [Chapter 52 [Title Only]]
Public Input No. 262-NFPA 1-2015 [Section No. 52.1]
Public Input No. 284-NFPA 1-2015 [New Section after 52.3.3.4]
Public Input No. 260-NFPA 1-2015 [Section No. 1.12.8]
Public Input No. 280-NFPA 1-2015 [Section No. 52.1]
Public Input No. 291-NFPA 1-2015 [New Section after 52.3.8.3]
Public Input No. 282-NFPA 1-2015 [Section No. 52.3.2]

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Chapter 52 Energy Storage Systems

52.1* General

52.1.1 Energy storage systems having a capacity greater than the quantities listed in Table 52.1 shall be in accordance with Chapter 52 and where used as a legally required emergency or standby power system, shall also comply with 11.7.3

Table 52.1
ENERGY STORAGE SYSTEM THRESHOLD QUANTITIES

TYPE	CAPACITY [a]
Lead acid batteries, all types	70 KWh (25.2 Mega joules)
Nickel cadmium batteries	70 KWh (18.0 Mega joules)
Lithium batteries, all types	20 KWh(18.0 Mega joules)
Sodium batteries, all types	20 KWh (18.0 Mega joules) [c]
Flow batteries [b]	20 KWh (18.0 Mega joules)
Other battery technologies	10 KWh (10.8 Mega joules)
Capacitors	70 KWh (25.2 Mega joules)

a – For batteries and capacitors rated in Amp-Hours, KWh shall equal rated voltage times amp-hour rating divided by 1000
b – Shall include vanadium, zinc-bromine, polysulfide-bromide, and other flowing electrolyte type technologies
c – 70 KWh (25.2 Mega joules) for sodium-ion technologies

A.52.1 The requirements in Chapter 52 supersede all the hazardous material designations, permits, and requirements in Chapter 60.

52.1.2 Permits.

52.1.2.1 Permits, where required, shall comply with Section 1.12.

Operations and Materials	Permit Required	Cross Reference Section Number
Energy storage systems including battery stationary storage systems and capacitor energy storage systems	To install and operate energy storage systems exceeding Table 52.1 Energy Storage System Threshold Quantities.	52.1.1

52.1.2.2 Prior to installation, plans shall be submitted and approved by the AHJ.

52.2* Stationary Storage Battery Systems

A.52.2 This section covers stationary battery systems that are typically used for facility standby power, emergency power, uninterrupted power supplies or load shedding/load

balancing applications.

Stationary storage battery systems that exceed the amounts specified in Table 52.1 pose potential hazards that are significant enough to require compliance with the requirements in this chapter. It is not the intent of this chapter to regulate equipment with integral standby power systems below the amounts in this table, such as emergency lighting units, fire alarm control units, and other appliances and equipment.

52.2.1 Location and Occupancy Separation. Stationary storage battery systems shall be located and constructed in accordance with this section.

52.2.1.1 Stationary storage battery systems shall be housed in a noncombustible, locked cabinet or other enclosure to prevent access by unauthorized personnel unless located in a separate equipment room accessible only to authorized personnel.

52.2.1.2 Location. Stationary storage battery systems shall not be located in areas where the floor is located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access, or where the floor level is more than 30 feet (9144 mm) below the finished floor of the lowest level of exit discharge.

Exceptions:

1. Lead acid and nickel cadmium stationary storage battery systems.
2. Installations on noncombustible rooftops of buildings exceeding 75 feet (22 860 mm) in height that do not obstruct fire department rooftop operations shall be permitted when approved by the AHJ.

52.2.1.3 Separation: Rooms containing stationary storage battery systems shall be located in high hazard occupancies, or shall be separated from other areas of the building as follows. Stationary storage battery systems shall be allowed to be in the same room with the equipment they support.

52.2.1.3.1 In other than assembly, educational, detention and correction facilities, health care, ambulatory health care, day care centers, residential board and care, and residential occupancies, stationary storage battery systems shall be located in a room separated from other portions of the building by a minimum of a 1-hour fire barrier.

52.2.1.3.2 In assembly, educational, detention and correction facilities, health care, ambulatory health care, day care centers, residential board and care, and residential occupancies, stationary storage battery systems shall be located in a room separated from other portions of the building by a minimum of a 2-hour fire barrier.

52.2.1.4 Outdoor installations. Stationary storage battery systems located outdoors shall comply with this Section, in addition to all applicable requirements of Chapter 52. Installations in outdoor enclosures or containers which are occupied for servicing,

testing, maintenance and other functions shall be treated as stationary storage battery system rooms.

Exception: Battery arrays in noncombustible containers shall not be required to be spaced three feet (914 mm) from the container walls.

52.2.1.4.1 Separation. Stationary storage battery systems located outdoors shall be separated by a minimum five feet (1524 mm) from the following:

Lot lines
Public ways
Buildings
Stored combustible materials
Hazardous materials
High-piled stock
Other exposure hazards

Exception: The AHJ is authorized to approve smaller separation distances if large scale fire and fault condition testing conducted or witnessed and reported by an approved testing laboratory is provided showing that a fire involving the system will not adversely impact occupant egress from adjacent buildings, or adversely impact adjacent stored materials or structures.

52.2.1.4.2 Means of egress. Stationary storage battery systems located outdoors shall be separated from any means of egress as required by the AHJ to ensure safe egress under fire conditions, but in no case less than 10 feet (3048 mm). The AHJ is authorized to approve smaller separation distances if large scale fire and fault condition testing conducted or witnessed and reported by an approved testing laboratory is provided showing that a fire involving the system will not adversely impact occupant egress.

52.2.1.4.3 Security of areas. Outdoor areas in which stationary storage battery systems are located shall be secured against unauthorized entry in an approved manner.

52.2.2 Maximum Allowable Quantities. Fire areas within buildings containing stationary storage battery systems exceeding the maximum allowable quantities in Table 52.2.2 shall comply with all applicable Ordinary Hazard and High Hazard requirements as identified in NFPA 101.6.2.2 and the building code. Where approved by the AHJ, areas containing stationary storage battery systems that exceed the amounts in Table 52.2.2 shall be permitted to be treated as ordinary hazard and not a high hazard classification based on a hazardous mitigation analysis in accordance with 52.2.4 and large scale fire and fault condition testing conducted or witnessed and reported by an approved testing laboratory.

TABLE 52.2.2
MAXIMUM ALLOWABLE QUANTITIES

TYPE	MAXIMUM ALLOWABLE QUANTITIES [a]	Hazard Classification
Lead acid batteries, all types	Unlimited	Ordinary hazard
Nickel cadmium batteries	Unlimited	Ordinary hazard
Lithium batteries, all types	600KWh	High hazard [c]
Sodium batteries , all types	600KWh	High hazard [c]
Flow batteries [b]	600KWh	High hazard [c]
Other battery technologies	200 KWh	High hazard [c]

a – For batteries rated in Amp-Hours, KWh shall equal rated voltage times amp-hour rating divided by 1000x

b – Shall include vanadium, zinc-bromine, polysulfide-bromide, and other flowing electrolyte type technologies

c - Shall be permitted to be ordinary hazard classification if approved by the AHJ based on (1) a hazard mitigation analysis conducted in accordance with Section 52.2.4 and (2) large scale fire and fault condition testing conducted or witnessed and reported by an approved testing laboratory that shows that a fire involving the stationary storage battery system is contained within the room for a duration equal to the fire resistance rating of the room separation required in Sections 52.2.1.3.1 or 52.2.1.3.2, as applicable.

52.2.2.1 Mixed energy systems. When areas within buildings contain a combination of energy system technologies, the total aggregate quantities shall be determined based on the sum of percentages of each type divided by the maximum allowable quantity of each type. If the sum of the percentages exceeds 100%, the area shall be treated as a high hazard classification in accordance with Table 52.1.4.

52.2.3* Battery Arrays: Storage batteries, prepackaged stationary storage battery systems and pre-engineered stationary storage battery systems shall be segregated into arrays not exceeding 50 KWh (180 Mega joules) each. Each array shall be spaced a minimum three feet (914 mm) from other arrays and from walls in the storage room or area. The storage arrangements shall comply with the egress provisions in NFPA 101.

Exceptions:

1. Lead acid and nickel cadmium storage battery arrays have no size limitations.
2 Listed pre-engineered stationary storage battery systems and prepackaged stationary storage battery systems shall not exceed 250 KWh (900 Mega joules) each.
3 The AHJ is authorized to approve listed pre-engineered and prepackaged battery arrays with larger capacities or smaller battery array spacing if large scale fire and fault condition testing conducted or witnessed and reported by an approved testing laboratory is provided showing that a fire involving one array will not propagate to an adjacent array, and be contained within the room for a duration equal to the fire resistance rating of the room separation required by Section 52.1.3.3.

A.52.2.3 A stationary battery array is an arrangement of individual stationary storage batteries in close proximity to each other, mounted on storage racks or in modules, battery cabinets or other enclosures.

52.2.4 Hazard Mitigation Analysis. A failure mode and effects analysis (FMEA) or other approved hazard mitigation analysis shall be provided to the AHJ when any of the following conditions are present.

1. Battery technologies not specifically identified in Table 52.1 are provided.
2. More than one stationary storage battery technology is provided in a room or indoor area where there is a potential for adverse interaction between technologies.
3. When allowed as a basis for increasing maximum allowable quantities as specified in Table 52.2.2.

52.2.4.1 The analysis shall evaluate the consequences of the following failure modes, and others deemed necessary by the AHJ. Only single failure modes shall be considered for each mode.

1. Thermal runaway condition in a single module or array.
2. Failure of a battery management system.
3. Failure of a required ventilation system.
4. Voltage surges on the primary electric supply.
5. Short circuits on the load side of the stationary battery storage system.
6. Failure of the smoke detection, fire suppression, or gas detection system.

52.2.4.2 Analysis approval. The AHJ is authorized to approve the hazardous mitigation analysis provided the consequences of the FMEA demonstrate:

1. Fires or explosions will be contained within unoccupied stationary storage battery system rooms for the minimum duration of the fire resistance rated specified in Section 52.2.1.3.1 or 52.2.1.3.2, as applicable.
2. Fires and explosions in stationary storage battery system cabinets in occupied work centers allow occupants to safely evacuate.
3. Toxic and highly toxic gases released during charging, discharging and normal operation shall not exceed the permissible exposure limit (PEL).
4. Toxic and highly toxic gases released during fires and other fault conditions shall not reach concentrations in access of IDLH level in the building or adjacent means of egress routes during the time deemed necessary to evacuate from that area.
5. Flammable gases released from batteries during charging, discharging and normal operation shall not exceed 25% of the lower flammable limit (LFL).

52.2.4.3 Construction, equipment and systems that are required for the stationary storage battery system to comply with the hazardous mitigation analysis shall be installed, maintained and tested in accordance with nationally recognized standards and specified design parameters.

52.2.5 Listings. Storage batteries shall be listed in accordance with UL 1973. Prepackaged and pre-engineered stationary storage battery systems shall be listed in accordance with UL 9540.

Exception: Lead-acid batteries are not required to be listed.

52.2.5.1 Prepackaged and pre-engineered systems. Prepackaged and pre-engineered stationary storage battery systems shall be installed in accordance with their listing and the manufacturer's instructions.

A.52.2.5 A prepackaged stationary storage battery system is designed and investigated as a single unit, assembled in a factory, and shipped to the site. A pre-engineered stationary storage battery system is designed and investigated as a single unit, but is shipped in modular form for assembly at the site.

52.2.5.2 Environment. The storage battery environment shall be controlled to maintain temperatures and conditions within the battery manufacturer's specifications.

52.2.6 Installation

52.2.6.1 Battery Management System. An approved battery management system shall be provided for battery technologies other than lead acid and nickel cadmium for monitoring and balancing cell voltages, currents and temperatures within the manufacturer's specifications. The system shall transmit an alarm signal to an approved location if potentially hazardous temperatures or other conditions including short circuits, overvoltage (overcharge) or under voltage (over discharge) are detected.

52.2.6.2 Battery chargers. Battery chargers shall be compatible with the battery manufacturer's electrical ratings and charging specifications. Battery chargers shall be listed in accordance with the UL 1564 or provided as part of a listed pre-engineered or prepackaged stationary storage battery system.

52.2.6.3 Vehicle impact protection. Vehicle impact protection shall be provided where stationary storage battery systems are subject to impact by motor vehicles.

52.2.6.4 Combustible storage. Combustible materials not related to the stationary storage battery system shall not be stored in battery rooms, cabinets or enclosures. Combustible materials in occupied work centers shall comply with Section 10.18 and shall not be stored within 3 feet (915 mm) from battery cabinets.

52.2.6.5 Signage. Approved signage shall be provided on doors or in approved locations near entrances to stationary battery storage system rooms. Existing stationary storage battery systems shall be permitted to include the signage required at the time it was installed. New installations shall require the following items.

1. Hazard identification markings in accordance with NFPA 704.

2. “This room contains energized battery systems”, or the equivalent.
3. Identification of the type(s) of batteries present
4. AUTHORIZED PERSONNEL ONLY
5. Technology specific markings, if required in 52.2.11
6. Where the battery storage system disconnecting means is not within sight of the Main Service disconnect, placards or directories shall be installed at the locations of the Main Service disconnect to indicate the location of all battery storage disconnecting means in accordance with NFPA 70.

52.2.6.5.1 Battery cabinets shall be provided with exterior labels that identify the manufacturer and model number of the system and electrical rating (voltage and current) of the contained battery system.

52.2.6.5.2 Signs shall be provided within battery cabinets to indicate the relevant electrical, chemical, and fire hazard.

52.2.6.5.3 Fire Command Centers. Fire command centers in buildings containing stationary storage battery systems shall include signage, or readily available documentation, that describes the location of stationary storage battery systems, the types of batteries present, operating voltages, and location of electrical disconnects.

52.2.6.6 Seismic Protection. In seismically active areas, battery systems shall be seismically braced in accordance with the building code.

52.2.6.7 Safety Caps. Vented batteries shall be provided with flame-arresting safety caps.

52.2.6.8* Mixed Battery Systems. Different types of batteries shall not be installed in the same room or cabinet if there is a potential for unsafe interaction between them, as determined by the AHJ.

A.52.2.6.8 This section is intended to address unique situations where the installation of different types of batteries in the same room or cabinet may create a situation where there is unacceptable chemical, thermal or other interaction between them, or where the surrounding environment is not within the battery manufacturers’ specifications. The AHJ has the option to require a hazard mitigation analysis, conducted in accordance with Section 52.2.4, to identify hazards and potential solutions that will mitigate the hazards.

52.2.7 Suppression and Detection.

52.2.7.1 Fire suppression. Rooms containing stationary storage battery systems shall be protected by an automatic sprinkler system installed in accordance with NFPA 13. Commodity classifications for specific technologies of storage batteries shall be in accordance with Chapter 5 of NFPA 13. If the storage battery types are not specifically addressed in Chapter 5 of NFPA 13, the AHJ shall be permitted to approve the fire

suppression system based on full scale fire and fault condition testing conducted or witnessed and reported by an approved laboratory.

> **Exception:** Automatic sprinkler systems shall not be required in spaces or areas containing lead acid stationary storage battery systems used exclusively for telecommunications equipment purposes.

52.2.7.2 Smoke detection. An approved automatic smoke detection system shall be installed in rooms containing stationary battery storage systems in accordance with NFPA 72.

52.2.8* Ventilation. Where required by Section 52.2.11, ventilation shall be provided for rooms and cabinets in accordance with the mechanical code and one of the following:
(1) The ventilation system shall be designed to limit the maximum concentration of flammable gas to 25% of the lower flammable limit (LFL) of the total volume of the room during the worst-case event of simultaneous “boost” charging of all the batteries, in accordance with nationally recognized standards.
(2) Mechanical ventilation shall be provided at a rate of not less than 1 ft3/min/ft2 (5.1 L/sec/m2) of floor area of the room or cabinet. The ventilation can be either continuous, or activated by a gas detection system in accordance with Section 52.2.8.2.

A.52.2.8 Information on battery room ventilation can be found in IEEE 1635/ASHRAE 21, Guide to Battery Room Ventilation and Thermal Management.

52.2.8.1 Required mechanical ventilation systems for rooms and cabinets containing storage batteries shall be supervised for by an approved central station, proprietary or remote station service or shall initiate an audible and visual signal at an approved constantly attended on-site location.

52.2.8.2 Where required by Section 52.2.8 (2) rooms containing stationary storage battery systems shall be protected by an approved continuous gas detection system. The gas detection system shall be designed to activate when the level of flammable gas exceeds 25 percent of the lower flammable limit (LFL). Activation of the gas detection system shall result in activate of the mechanical ventilation system which shall remain on until the flammable gas detected is less than 25% of the LFL. The gas detection system shall include a minimum two hours of standby power. Failure of the gas detection system shall annunciate a trouble signal at an approved central station, proprietary or remote station service, or when approved at a constantly attended onsite location.

52.2.9* Spill control and neutralization. Where required by Section 52.2.11, approved methods and materials shall be provided for the control and neutralization of spills of electrolyte or other hazardous materials in rooms containing stationary storage batteries as follows:

1. For batteries with free flowing electrolyte, the method and materials shall be capable of neutralizing a spill of the total capacity from the largest cell or block to a pH between 5.0 and 9.0.
2. For batteries with immobilized electrolyte, the method and materials shall be capable of neutralizing a spill of 3.0 percent of the capacity of the largest cell or block in the room to a pH between 5.0 and 9.0.

A.52.2.9 Methods of achieving this protection can include, but are not limited to, the following:
(1) Liquid tight sloped or recessed floors in indoor locations or similar areas in outdoor locations
(2) Liquid tight floors in indoor locations or similar areas in outdoor locations provided with liquid tight raised or recessed sills or dikes
(3) Sumps and collection systems

52.2.10 Thermal Runaway. Where required by Section 52.2.11, a listed device or other approved method shall be provided to preclude, detect, and control thermal runaway.

52.2.11 Battery Specific Protection Stationary storage battery systems shall comply with the Sections 52.2 through 52.2.10 and this section, as applicable.

52.2.11.1 Lead Acid Batteries. Stationary storage battery systems utilizing lead acid batteries shall comply with the following:
1. Ventilation shall be provided in accordance with Section 52.2.8.
2. Spill control and neutralization shall be in accordance with Section 52.2.9.
3. Thermal runaway protection shall be provided for VRLA storage batteries in accordance with Section 52.2.10.

52.2.11.2 Nickel Cadmium Batteries. Stationary storage battery systems utilizing lead acid batteries shall comply with the following:
1. Ventilation shall be provided in accordance with Section 52.2.8.
2. Spill control and neutralization shall be in accordance with Section 52.2.9.
3. Thermal runaway protection shall be provided in accordance with Section 52.2.10.

52.2.11.3 Lithium Batteries. Stationary storage battery systems utilizing lithium batteries shall comply with the following:
1. Thermal runaway protection shall be provided in accordance with Section 52.2.10.

52.2.11.4 Sodium Batteries. Stationary storage battery systems utilizing sodium batteries shall comply with the following:
1. Ventilation shall be provided in accordance with Section 52.2.8.
2. Spill control and neutralization shall be in accordance with Section 52.2.9.
3. Thermal runaway protection shall be provided for in accordance with Section 52.2.10.

4. A hazard mitigation analysis shall be provided for systems that utilize sodium sulfur batteries, or other sulfur type battery systems that operate above ambient temperatures.
5. The signage required in Section 52.2.6.5 shall include, when applicable, “Water Reactive Hazard – Apply No Water”.

52.2.11.5 Flow batteries. Stationary storage battery systems utilizing flow batteries shall comply with the following:
1. Ventilation shall be provided in accordance with Section 52.2.8.
2. Spill control and neutralization shall be in accordance with Section 52.2.9.

52.2.11.6 Other Battery Types. Stationary storage battery systems utilizing battery technologies other than those described above shall comply with the following:
1. Ventilation shall be provided in accordance with Section 52.2.8 when flammable, toxic or highly toxic gases may be present during charging, discharging and normal system use.
2. Spill control and neutralization shall be in accordance with Section 52.2.9 when the batteries contain electrolytes that may be released from the batteries.
3. Thermal runaway protection shall be provided in accordance with Section 52.2.10.
4. The signage required in Section 52.2.6.5 shall also identify any potential hazards associated with the batteries.

52.2.12 Testing, Maintenance and Repairs. Stationary storage batteries and associated equipment and systems shall be tested and maintained in accordance with the manufacturer’s instructions. Any storage batteries or system components used to replace existing units shall be compatible with the battery charger, battery management systems, other storage batteries, and other safety systems.

52.3 Capacitor Energy Storage Systems.

52.3.1 Stationary capacitor energy storage systems having capacities greater than those described in Table 52.1 shall comply with this Section.

52.3.2 Location and Occupancy Separation. Stationary capacitor energy storage systems shall be located and constructed as required for stationary storage battery system in accordance with Section 52.2.1 through 52.2.1.4.3.

52.3.3 Maximum Allowable Quantities. Fire areas within buildings containing capacitor energy storage systems exceeding 600 KWh shall comply with all applicable Ordinary Hazard and High Hazard requirements as identified in NFPA 101.6.2.2 and the building code.

52.3.4 Capacitor Arrays: Capacitors, prepackaged stationary capacitor energy storage systems, and pre-engineered capacitor energy storage systems shall be segregated into arrays not exceeding 50 KWh (180 Mega joules) each. Each array shall be spaced

a minimum three feet (914 mm) from other arrays and from walls in the storage room or area. The storage arrangements shall comply with the egress provisions in NFPA 101.

52.3.5 Listings. Capacitors shall be listed in accordance with UL 1973. Prepackaged and pre-engineered capacitor energy systems shall be listed in accordance with UL 9540.

52.3.5.1 Prepackaged and pre-engineered systems. Prepackaged and pre-engineered capacitor energy storage systems shall be installed in accordance with their listing and the manufacturer's instructions.

A.52.3.5 A prepackaged capacitor energy system is designed and investigated as a single unit, assembled in a factory, and shipped to the site. A pre-engineered capacitor energy system is designed and investigated as a single unit, but is shipped in modular form for assembly at the site.

52.3.5.2 Environment. The environment surrounding the capacitors shall be controlled to maintain temperatures and conditions within the manufacturer's specifications.

52.3.6 Chargers. Capacitor chargers shall be compatible with the capacitor manufacturer's electrical ratings and charging specifications, and shall be listed in accordance with the UL 1564 or provided as part of a listed pre-engineered or prepackaged capacitor energy storage system.

52.3.7 Vehicle impact protection. Vehicle impact protection shall be provided where capacitor energy storage systems are subject to impact by motor vehicles.

52.3.8 Combustible storage. Combustible materials not related to the capacitor energy storage system shall not be stored in capacitor rooms, cabinets or enclosures. Combustible materials in occupied work centers shall comply with Section 10.18 and shall not be stored within 3 feet (915 mm) from capacitor cabinets.

52.3.9 Signage. Approved signage shall be provided on doors or in approved locations near entrances to capacitor energy storage systems, and shall include the following:

1. Hazard identification markings in accordance with NFPA 704.
2. "This room contains energized capacitor systems", or the equivalent
3. Identification of the type(s) of capacitors present
4. AUTHORIZED PERSONNEL ONLY
5. Where the capacitor energy storage system disconnecting means is not within sight of the Main Service disconnect, placards or directories shall be installed at the locations of the Main Service disconnect to indicate the location of all capacitor energy storage system disconnecting means in accordance with NFPA 70.

52.3.9.1 Capacitor cabinets shall be provided with exterior labels that identify the manufacturer and model number of the system and electrical rating (voltage and current) of the contained battery system. Signs shall be provided within capacitor cabinets to indicate the relevant electrical, chemical, and fire hazard.

52.3.9.2 Fire Command Centers. Fire command centers in buildings containing capacitor energy storage systems shall include signage, or readily available documentation, that describes the location of the systems, the types of capacitors present, operating voltages, and location of electrical disconnects.

52.3.10 Seismic Protection. In seismically active areas, capacitor energy storage systems shall be seismically braced in accordance with the building code.

52.3.11 Testing, Maintenance and Repairs. Capacitor energy storage systems and associated equipment and systems shall be tested and maintained in accordance with the manufacturer's instructions. Any capacitors or system components used to replace existing units shall be compatible with the capacitor charger, other capacitors, and other safety systems.

Public Comment No. 90-NFPA 1-2016 [Chapter 52]

Chapter 52 Stationary Storage Battery Systems

52.1* General.

Stationary storage battery systems having an electrolyte capacity of more than 100 gal (378.5 L) in sprinklered buildings or 50 gal (189.3 L) in unsprinklered buildings for flooded lead-acid, nickel-cadmium, and valve-regulated lead–acid (VRLA) batteries or 1000 lb (454 kg) for lithium-ion and lithium metal polymer batteries used for facility standby power, emergency power, or uninterrupted power supplies shall be in accordance with Chapter 52 and Table 52.1.

Table 52.1 Battery Requirements

Requirement	Nonrecombinant Batteries		Recombinant Batteries		Other
	Flooded Lead-Acid	Flooded Nickel-Cadmium (Ni-Cd)	Valve-Regulated Lead–Acid (VRLA)	Lithium-Ion	Lithium Metal Polymer
Safety caps	Venting caps	Venting caps	Self-resealing flame-arresting caps	No caps	No caps
Thermal runaway management	Not required	Not required	Required	Not required	Required
Spill control	Required	Required	Not required	Not required	Not required
Neutralization	Required	Required	Required	Not required	Not required
Ventilation	Required	Required	Required	Not required	Not required
Signage	Required	Required	Required	Required	Required
Seismic control	Required	Required	Required	Required	Required
Fire detection	Required	Required	Required	Required	Required

52.2 Permits.

52.2.1

Permits, where required, shall comply with Section 1.12.

52.2.2

Prior to installation, plans shall be submitted and approved by the AHJ.

52.3 Safety Features.

52.3.1 Safety Venting.

Batteries shall be provided with safety venting caps as follows in 52.3.1.1 through 52.3.1.3.

52.3.1.1 Nonrecombinant Batteries.

Vented lead-acid, nickel-cadmium, or other types of nonrecombinant batteries shall be provided with safety venting caps.

52.3.1.2 Recombinant Batteries.

VRLA or other types of sealed, recombinant batteries shall be equipped with self-resealing flame-arresting safety vents.

52.3.1.3

Lithium-ion and lithium metal polymer batteries shall not require safety venting caps.

52.3.2 Thermal Runaway.

VRLA, lithium-ion, and lithium metal polymer battery systems shall be provided with a listed device or other approved method to preclude, detect, and control thermal runaway.

52.3.3 Location and Occupancy Separation.

52.3.3.1

Battery systems shall be permitted in the same room as the equipment that they support.

52.3.3.2

Battery systems shall be housed in a noncombustible, locked cabinet or other enclosure to prevent access by unauthorized personnel unless located in a separate equipment room accessible only to authorized personnel.

52.3.3.3

In other than assembly, educational, detention and correction facilities, health care, ambulatory health care, day care centers, residential board and care, and residential occupancies, battery systems shall be located in a room separated from other portions of the building by a minimum of a 1-hour fire barrier.

52.3.3.4

In assembly, educational, detention and correction facilities, health care, ambulatory health care, day care centers, residential board and care, and residential occupancies, battery systems shall be located in a room separated from other portions of the building by a minimum of a 2-hour fire barrier.

52.3.4 Spill Control.

52.3.4.1

Rooms, buildings, or areas containing free-flowing liquid electrolyte in individual vessels having a capacity of more than 55 gal (208 L) or multiple vessels having an aggregate capacity exceeding 1000 gal (3785 L) shall be provided with spill control to prevent the flow of liquids to adjoining areas.

52.3.4.2*

An approved method and materials for the control of a spill of electrolyte shall be provided that will be capable of controlling a spill from the single largest vessel.

52.3.4.3

VRLA, lithium-ion, lithium metal polymer, or other types of sealed batteries with immobilized electrolyte shall not require spill control.

52.3.5 Neutralization.

52.3.5.1*

An approved method to neutralize spilled electrolyte shall be provided.

52.3.5.2

For nonrecombinant batteries and VRLA batteries, the method shall be capable of neutralizing a spill from the largest battery to a pH between 7.0 and 9.0.

52.3.5.3

Lithium-ion and lithium metal polymer batteries shall not require neutralization.

52.3.6* Ventilation.

For flooded lead-acid, flooded nickel-cadmium, and VRLA batteries, ventilation shall be provided for rooms and cabinets in accordance with the mechanical code and one of the following:

(1) The ventilation system shall be designed to limit the maximum concentration of hydrogen to 1.0 percent of the total volume of the room during the worst-case event of simultaneous “boost” charging of all the batteries, in accordance with nationally recognized standards.

(2) Continuous ventilation shall be provided at a rate of not less than 1 $ft^3/min/ft^2$ (5.1 $L/sec/m^2$) of floor area of the room or cabinet.

52.3.6.1

Lithium-ion and lithium metal polymer batteries shall not require ventilation.

52.3.7 Environment.

The battery environment shall be controlled or analyzed to maintain temperature in a safe operating range for the specific battery technology used.

52.3.8 Signs.

52.3.8.1

Doors or accesses into the following shall be provided with approved signs:

(1) Battery storage buildings

(2) Rooms containing stationary storage battery systems

(3) Other areas containing stationary storage battery systems

52.3.8.2

For rooms that contain Valve-Regulated Lead–Acid (VRLA), Lithium-Ion, or Lithium Metal Polymer batteries, the signs required by 52.3.8.1 shall state the following:

This room contains:

(1) Stationary storage battery systems

(2) Energized electrical circuits

52.3.8.3

For rooms that contain Flooded Lead-Acid or Flooded Nickel-Cadmium (Ni-Cd) batteries, the signs required by 52.3.8.1 shall state the following:

This room contains:

(1) Stationary storage battery systems

(2) Energized electrical circuits

(3) Corrosive battery electrolyte

52.3.8.4

Battery cabinets shall be provided with exterior labels that identify the manufacturer and model number of the system and electrical rating (voltage and current) of the contained battery system.

52.3.8.5

Signs shall be provided within battery cabinets to indicate the relevant electrical, chemical, and fire hazard.

52.3.9 Seismic Protection.

In seismically active areas, battery systems shall be seismically braced in accordance with the building code.

52.3.10 Smoke Detection.

An approved automatic smoke detection system shall be installed in such areas and supervised by an approved central, proprietary, or remote station service or a local alarm that will give an audible signal at a constantly attended location.

Statement of Problem and Substantiation for Public Comment

The Committee Input No. 137-NFPA 1-2015 [Chapter 52] creates major issues for the currently deployed stationary battery systems and the past 30 years of evolution of the codes in regulating thousands of installations nationwide. New technologies such as the fuel cells and other technologies for energy storage (Lithium-ion) need to be addressed by the codes and standards but should not impact existing technologies that have proven history of safe installations. I request that the existing requirements of NFPA 1 Chapter 52 remain as currently stated (2015 edition of NFPA 1) for stationary battery systems such as Lead acid, Nickel Cadmium and Valve-regulated Lead-acid. Further, that new section be added either under Chapter 52 or a new chapter to address the very different and evolving technologies noted in the Committee's proposal. No supporting documentation or justifications have been provided for the sweeping changes to the current requirements. The Telecommunication and Information Technology industries were not involved in the review and development of these changes to the

existing codes. The current deployments in these industries and the active functioning of these installations with no identifiable code or major safety incidents supports the continued application of the 2015 code requirements. Major changes required for these thousands of installations by the Committee proposal have no justification and as noted in the NFPA 1 Handbook Commentary that the expansion of these systems nationwide that have it was not noted that there has been an increased of incidents reported nor was there any recent major incidents identified. The changes such as new methods for determining thresholds not normally associated with the current battery installation for determination of battery quantities, Hazard Mitigation Analysis, ventilation requirements and supervision, fire suppression, gas detection systems and changes in signage requirements all bring excessive capital and expense costs to current and future installations. These were not identified as issues when the new technologies project and committees were started.. These costs are retro-active on thousands of installations of a proven and safe technology used by the Telecommunications and Information Technology industries. The newer technologies need to be properly regulated by the codes and this can be done under a new section for those risks and installations.

The current proposals were developed by individuals representing the new technologies and identified issues and risks for those new technologies as documented in the recent document published by the Research Foundation "Hazard Assessment for Lithium Ion Battery Energy Storage Systems". This research did not address other technologies such as the legacy lead-acid batteries deployed across the nation. The research and advisory committees were not meant to address other technologies therefore the conclusions and recommendations should not be applied to all Energy Storage Systems ESS.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 98-NFPA 1-2016 [Section No. 52.3.10]	

Related Item

Committee Input No. 137-NFPA 1-2015 [Chapter 52]

Submitter Information Verification

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Public Comment No. 103-NFPA 1-2016 [New Section after 52.1]

Editorial – this submission is based on the Committee input item 137, but has been edited so that it can be included in a separate chapter or subchapter so that the current requirements for Pb-acid and Nickel Cadmium batteries can be retained intact in section 52 without additional and unjustified requirements, which are intended for new and unproven technologies.

Proposed New Chapter or Sub-Chapter on Energy Systems

Chapter X Energy Systems

Chapter X.1* New and Emerging Electrical Energy Storage Systems

A.X.1 This section covers new and emerging electrical energy storage systems including stationary battery technology systems other than lead acid and nickel cadmium technologies. These new technologies may be used for facility standby power, emergency power, uninterrupted power supplies or load shedding/load balancing applications. As new technologies, they will often necessitate a higher level of fire protection.

The requirements in Chapter X supersede all the hazardous material designations, permits, and requirements in Chapter 60.

X.1.1General

X.1.1.1 Energy storage systems having a capacity greater than the quantities listed in Table X.1.1 shall be in accordance with Chapter X and where used as a legally required standby power system, shall also comply with 11.7.3.

Note: Lead acid and nickel cadmium batteries are not addressed in Chapter X. Refer to Chapter 52 for the requirements applicable to energy storage systems comprised of lead acid and nickel cadmium batteries

Table X.1.1.1

BATTERY THRESHOLD QUANTITIES

BATTERY TECHNOLOGY	CAPACITY [a]
Lithium, all types	5 KWh (3.6 Mega joules)
Sodium, all types [c]	5 KWh (3.6 Mega joules)
Flow batteries [b]	5 KWh (3.6 Mega joules)
Other battery technologies	3 KWh (3.6 Mega joules)

a – For batteries rated in Amp-Hours, KWh shall equal rated voltage times amp-hour rating

b – Shall include vanadium, zinc-bromine, polysulfide-bromide, and other flowing electrolyte type technologies

c – 7 KWh for sodium-ion technologies

X.1.2 Listings and approvals.

Battery technologies covered by Chapter X shall be listed and labeled in accordance with the ANSI/UL1973 Standard for Batteries for Use in Light Rail Applications and Stationary Applications or the UL 9540 Outline of Investigation for Energy Storage Systems and Equipment .

X.1.3 Permits.

X.1.3.1 Operational Permits, shall be required and comply with Section 1.12 and Table 1.12.8(a).

X.1.3.2 Installation permits shall be required, submitted and approved by the AHJ.

X.1.4 Location and Occupancy Separation.

X.1.4.1 Battery systems shall be permitted in the same room as the equipment that they support.

X.1.4.2 Battery systems shall be housed in a noncombustible, locked cabinet or other enclosure to prevent access by unauthorized personnel unless located in a separate equipment room accessible only to authorized personnel.

X.1.4.3 In occupancies other than assembly, educational, detention and correction, health care, ambulatory health care, day care, residential board and care, and residential, battery systems shall be located in a room separated from other portions of the building by a minimum of a 1-hour fire

barrier.

X.1.4.4 In assembly, educational, detention and correction, health care, ambulatory health care, day care, residential board and care, and residential occupancies, battery systems shall be located in a room separated from other portions of the building by a minimum of a 2-hour fire barrier.

X.1.5 Hazard mitigation analysis for energy storage systems.

X.1.5.1 A fire risk and failure modes/effects analysis that includes information on hazard mitigation related to the following items associated with energy storage system systems covered by Table X.1 shall be provided to and approved by the AHJ.

X.1.5.2 The analysis, as required by X.1.6.1, shall include information on the following:

(1) Safety venting

(2) Thermal runaway management

(3) Spill control

(4) Neutralization

(5) Ventilation

(6) Signage

(7) Seismic protection

(8) Fire detection

(9) Fire suppression

(10) Fire-resistance separation rating; both vertical and horizontal

(11) Gas detection

X.1.5.3 Safety Features.

X.1.5.3.1Safety Venting.

X.1.5.3.1.1 Batteries shall be provided with flame arresting safety venting caps in accordance with X.7.1.1 through X.7.1.3 and Chapter 60.

X.1.5.3.1.2 Nonrecombinant batteries shall be provided with safety venting caps with flame arrestors.

X.1.5.3.1.3 Sealed, recombinant batteries shall be equipped with self-resealing flame-arresting safety vents to relieve over-pressure.

X.1.5.3.1.4 Lithium-ion and lithium metal polymer batteries shall not require safety venting caps but shall include an approved means to relieve over-pressure.

X.1.5.3.2 Thermal Runaway. Lithium-ion, and lithium metal polymer energy storage systems shall be provided with a listed device or other approved method to preclude, detect, and control conditions that can lead to a thermal runaway.

X.1.6. Stationary Battery Energy Storage Location and Occupancy Separation.

X.1.6.1 Energy storage systems shall be permitted in the same room as the equipment that they support.

X.1.6.2 Energy storage systems shall be housed in a noncombustible, locked cabinet or other enclosure to prevent access by unauthorized personnel unless located in a separate equipment room accessible only to authorized personnel.

X.1.6.3 When installed in a building situated within a flood hazard area, the location of the energy storage system systems shall be in accordance with NFPA 5000 *Building Construction and Safety Code* , Section X.2, or equivalent requirements of the locally adopted building code.

X.1.6.4 Energy storage systems in occupancies other than assembly, educational, detention and correction, health care, ambulatory health care, day care, residential board and care, and residential, energy storage systems shall be located in a room separated from other portions of the building by a minimum of a 1-hour fire barrier.

X.1.6.5 Energy storage systems in assembly, educational, detention and correction, health care, ambulatory health care, day care, residential board and care, and residential occupancies, shall be located in a room separated from other portions of the building by a minimum of a 2-hour fire barrier.

X.1.7 Spill Control.

X.1.7.1 Rooms, buildings, or areas containing free-flowing liquid electrolyte in individual vessels having a capacity of more than 55 gal (208 L) or multiple vessels having an aggregate capacity exceeding 1000 gal (3785 L) shall be provided with spill control to prevent the flow of liquids to adjoining areas.

X.1.7.2* An approved method and materials for the control of a spill of electrolyte shall be provided that will be capable of controlling a spill from the single largest vessel.

X.1.7.3 Lithium-ion, lithium metal polymer, or other types of sealed batteries with immobilized electrolyte shall not require spill control.

X.1.8 Neutralization.

X.1.8.1* An approved method to neutralize spilled corrosive electrolyte shall be provided. It shall be capable of neutralizing a spill from the largest battery to a pH between 7.0 and 9.0.

X.1.8.2 For nonrecombinant batteries, the method shall be capable of neutralizing a spill from the largest battery to a pH between 7.0 and 9.0.

X.1.8.3 Lithium-ion and lithium metal polymer batteries shall not require neutralization.

X.1.9 Ventilation.

X.1.9.1 For batteries that can vent hydrogen or other flammable gas, ventilation shall be provided for rooms and cabinets in accordance with one of the following:

(1) The ventilation system shall be designed to limit the maximum concentration of combustible gas to 25% of the LFL, or

(2) Continuous ventilation shall be provided at a rate of not less than 1 ft3/min/ft2 (5.1 L/sec/m2) of floor area of the room or cabinet.

X.1.10 Environment The battery environment shall be controlled or analyzed to maintain temperature in a safe operating range for the specific battery technology used.

X.1.11. Signage.

X.1.11.1 Signage identifying total energy storage system capacity (kWh) shall be posted on doors or in approved locations near entrances to stationary battery storage system rooms .

X.1.11.2 Approved signage indicating “danger” “warning” or “caution” shall be specific to the technology hazard of the battery type.

X.1.11.2.1 The sign shall be a minimum 8 in. (200 mm) wide and 6 in. (150 mm) high and shall include the following:

1. Hazard identification markings in accordance with NFPA 704.

2. Where the energy storage system disconnecting means is not within sight of the Main Service disconnecting means, placards or directories shall be installed at the locations of the Main Service indicating the location of all energy storage disconnecting means in accordance with NFPA 70.

X.1.11.2.2 Signs shall be provided on doors or in approved locations near entrances to stationary battery storage system rooms.

X.1.12 Seismic and structural design. Seismic and structural design shall be provided in accordance with the building code and shall not exceed the floor loading limitation of the building.

X.1.13 Fire detection. An approved automatic smoke detection system shall be installed in rooms containing *stationary battery storage systems* in accordance with NFPA 72.

X.1.14 Fire Command Centers. Buildings that require or have a fire command center shall have identified the location, size, voltage and disconnects for stationary stored energy battery systems as identified in X.1.2.

X.1.15 Fire suppression. Rooms containing *Stationary battery storage systems* shall be protected by an automatic sprinkler system installed in accordance with NFPA 13.

X.1.15.1 Commodity classifications. Commodity classifications for the storage of lithium-ion, sodium-beta, and flow batteries shall be in accordance with NFPA 13 Chapter 5.

X.1.16 Fire-resistance separation rating. Both vertical and horizontal shall be in accordance with section X.1.5.

X.1.17 Toxic and highly toxic gases. Stationary battery systems that have the potential to

release in excess of 20 cubic feet (0.566 m3) of toxic or highly toxic gas at normal temperature and pressure (NTP) shall not be installed in Assembly, Educational, Institutional, Residential occupancies, or in occupied offices, retail sales and portions of Industrial and storage occupancies.

X.1.18 Mechanical ventilation. Ventilation of indoor areas containing stationary storage battery systems shall be provided in accordance with the Mechanical Code and the following:

1. The ventilation system shall be designed to limit the maximum concentration of hydrogen to 1.0 percent of the total volume of the room. For batteries that have the potential to produce other combustible gas, the ventilation system shall be designed to limit the maximum concentration of combustible gas to 25% of the LFL, or

2. Continuous ventilation shall be provided at a rate of not less than 1 cubic foot per minute per square foot (1 ft3/min/ft2) [0.0051 m3/s • m2] of floor area of the room.

X.1.19 Cabinet ventilation. Where batteries that have the potential to produce hydrogen or other combustible gases are installed inside a cabinet, the cabinet shall be approved for use in occupied spaces and shall be mechanically or naturally vented by one of the following methods:

1. The cabinet ventilation shall limit the maximum concentration of hydrogen to 1 percent of the total volume of the cabinet, or 25 % of the combustible gas LFL during the worst-case event of simultaneous “boost” charging of all the batteries in the cabinet.

2. Where calculations are not available to substantiate the ventilation rate, continuous ventilation shall be provided at a rate of not less than 1 cubic foot per minute per square foot [1 ft3/min/ft2 or 0.0051 m3/(s • m2)] of floor area covered by the cabinet. The room in which the cabinet is installed shall be ventilated as required in X.1.18.

X.1.20 Supervision. Mechanical ventilation systems, where required by X.1.19 and X.1.20 shall be supervised by an approved central station, proprietary or remote station service or shall initiate an audible and visual signal at an approved constantly attended on-site location.

X.1.21 Gas detection system. A gas detection system shall be provided to protect areas that have the potential to contain a flammable gas, toxic gas or highly toxic gas from stationary battery systems during normal charging, discharging or fault conditions. Systems designed to detect flammable gases shall activate mechanical ventilation complying with X.1.18 when the level of flammable gas exceeds 25 percent of the lower flammable limit (LFL). Systems designed to detect toxic and highly toxic gases shall comply with NFPA 55.

X.1.22 Battery Management System. A battery management system shall be provided for the control and protection of the battery. The battery management system (BMS) shall provide monitoring of cell, module and battery voltages, module and battery current and cell temperatures. The BMS shall maintain the cells and batteries within the manufacturer’s specification for current, voltage and temperature. In addition, active cell balancing shall be provided for safety of the battery energy storage system.

X.1.23 Restricted access. Provisions shall be provided to prevent access to areas and cabinets containing stationary battery storage systems by unauthorized personnel.

X.1.24 Mixed battery systems

X.1.24.1 When areas within buildings containing stationary battery storage systems include different types of batteries, the total aggregate quantities of batteries shall be determined based on the sum of percentages of actual quantities divided by the maximum allowable quantities of each battery type. If the sum of the percentages exceeds 100%, the area shall be treated as a hazardous area.

X.1.24.2 If Batteries of different chemistries are mixed in any enclosed locations they are to be approved by the fire code official based on a hazard mitigation analysis conducted in accordance with X.1.6.

X.1.25 Spacing. Batteries, prepackaged stationary battery storage systems and preengineered stationary battery storage systems shall be segregated into storage arrays not exceeding 400 KWh each. Each array shall be spaced a minimum three feet (914 mm) from other battery arrays and from walls in the storage area.

Exception: Individual arrays of prepackaged stationary battery storage systems and preengineered stationary battery storage systems encased in metal enclosures shall be permitted to not exceed 500 KWh.

X.1.26 System classification. S tationary battery storage systems shall be classified as one of the following types:

1. Batteries

2. Pre-packaged battery storage systems.

3. Pre-engineered battery storage systems

X.1.27 Chargers. Capacitor chargers shall be compatible with the capacitor system charging specifications.

X.1.28 Inverters. Inverters shall be listed and labeled in accordance with UL 1741 or UL. UL 62109-1 Only inverters listed and labeled for utility interactive system use and identified as interactive shall be permitted to operate in parallel with the electric utility power system to supply power to common loads.

X.1.29 Battery specific protection. Stationary battery systems shall comply with Section X.1.30 requirements based on the type of battery technology utilized in the system. See Section X.1.25 for mixed battery systems.

X.1.29.1 Lithium-ion batteries .

X.1.29.1.1 Ventilation. Areas containing lithium-ion batteries shall be provided with ventilation in accordance with X.1.10.

X.1.29.1.2 Signage. Signage shall be provided in accordance with X.1.12.2 and shall include the following or equivalent wording:

X.1.29.2 Sodium beta batteries.

X.1.29.2.1 Gas detection . Gas detection (SO 2) for sodium sulfur batteries shall be provided in accordance with X.1.22.

X.1.29.2.2 Signage. Signage shall be provided in accordance with X.1.12.2 and shall include the following or equivalent wording:

X.1.29.3 Flow batteries.

X.1.29.3.1 Spill control and neutralization. Spill control and neutralization shall be provided for areas containing flowing electrolyte storage batteries in accordance with X.1.8 and X.1.9.

X.1.29.3.2 Ventilation. Areas containing flow batteries shall be provided with ventilation in accordance withX.1.10.

X.1.29.3.3 Gas detection . Gas detection for flow batteries shall be provided in accordance with X.1.22.

X.1.29.3.4 Signage. Signage shall be provided in accordance with X.1.12.2 and shall include the following or equivalent wording:

X.1.29.4 Other battery technologies.

X.1.29.4.1 Spill control and neutralization. Spill control and neutralization shall be provided for areas containing batteries with free flowing electrolytes or other hazardous materials in liquid form in accordance with X.1.8 and X.1.9.

X.1.29.4.2 Ventilation. Areas containing batteries that have the potential to release flammable gas under charging, discharging, and fault conditions shall be provided with ventilation in accordance with Section X.1.10.

Additional Proposed Changes

File Name	Description	Approved
New_Section_X.pdf	This section is same as entered but has graphics for sign wording included.	

Statement of Problem and Substantiation for Public Comment

The changes proposed by the committee in 137 include sweeping changes to an established chapter of the code that was developed over several code cycles with broad input from the major users of standby battery systems. The increased levels of protection included in the draft changes, while suitable for newer and unproven technologies such as Lithium-ion and Nickel Metal Halide or Nickel Metal Hydride, are not required for lead acid and Nickel Cadmium batteries which are well addressed in the current code and have an exemplary safety record.

Early proposals to address concerns of new technologies in Chapter 52 alluded to the possibility of including these requirements in a new chapter or sub-chapter. It is the position of telecom carriers such as Verizon and CenturyLink and others that inclusion of a new chapter or sub-chapter, with the existing Pb acid and Nickel Cadmium requirements intact is a better approach. It is easy for the code official to determine which types of batteries are present and what part of the code is applicable. This structure prevents numerous exceptions for Pb-acid and Nickel Cadmium batteries that would otherwise be needed.

Related Item

Committee Input No. 137-NFPA 1-2015 [Chapter 52]

Submitter Information Verification

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Editorial – this submission is based on the Committee input item 137, but has been edited so that it can be included in a separate chapter or subchapter so that the current requirements for Pb-acid and Nickel Cadmium batteries can be retained intact in section 52 without additional and unjustified requirements, which are intended for new and unproven technologies.

Proposed New Chapter or Sub-Chapter on Energy Systems

Chapter X Energy Systems

Chapter X.1* New and Emerging Electrical Energy Storage Systems

A.X.1 This section covers new and emerging electrical energy storage systems including stationary battery technology systems other than lead acid and nickel cadmium technologies. These new technologies may be used for facility standby power, emergency power, uninterrupted power supplies or load shedding/load balancing applications. As new technologies, they will often necessitate a higher level of fire protection.

The requirements in Chapter X supersede all the hazardous material designations, permits, and requirements in Chapter 60.

X.1.1General

X.1.1.1 Energy storage systems having a capacity greater than the quantities listed in Table X.1.1 shall be in accordance with Chapter X and where used as a legally required standby power system, shall also comply with 11.7.3.

Note: Lead acid and nickel cadmium batteries are not addressed in Chapter X. Refer to Chapter 52 for the requirements applicable to energy storage systems comprised of lead acid and nickel cadmium batteries

Table X.1.1.1
BATTERY THRESHOLD QUANTITIES

BATTERY TECHNOLOGY	CAPACITY [a]
Lithium, all types	5 KWh (3.6 Mega joules)
Sodium, all types [c]	5 KWh (3.6 Mega joules)
Flow batteries[b]	5 KWh (3.6 Mega joules)
Other battery technologies	3 KWh (3.6 Mega joules)

a – For batteries rated in Amp-Hours, KWh shall equal rated voltage times amp-hour rating
b – Shall include vanadium, zinc-bromine, polysulfide-bromide, and other flowing electrolyte type technologies
c – 7 KWh for sodium-ion technologies

X.1.2 Listings and approvals.

Battery technologies covered by Chapter X shall be listed and labeled in accordance with the ANSI/UL1973 Standard for Batteries for Use in Light Rail Applications and Stationary Applications or the UL 9540 Outline of Investigation for Energy Storage Systems and Equipment.

X.1.3 Permits.

X.1.3.1 Operational Permits, shall be required and comply with Section 1.12 and Table 1.12.8(a).

X.1.3.2 Installation permits shall be required, submitted and approved by the AHJ.

X.1.4 Location and Occupancy Separation.

X.1.4.1 Battery systems shall be permitted in the same room as the equipment that they support.

X.1.4.2 Battery systems shall be housed in a noncombustible, locked cabinet or other enclosure to prevent access by unauthorized personnel unless located in a separate equipment room accessible only to authorized personnel.

X.1.4.3 In occupancies other than assembly, educational, detention and correction, health care, ambulatory health care, day care, residential board and care, and residential, battery systems shall be located in a room separated from other portions of the building by a minimum of a 1-hour fire barrier.

X.1.4.4 In assembly, educational, detention and correction, health care, ambulatory health care, day care, residential board and care, and residential occupancies, battery systems shall be located in a room separated from other portions of the building by a minimum of a 2-hour fire barrier.

X.1.5 Hazard mitigation analysis for energy storage systems.

X.1.5.1 A fire risk and failure modes/effects analysis that includes information on hazard mitigation related to the following items associated with energy storage system systems covered by Table X.1 shall be provided to and approved by the AHJ.

X.1.5.2 The analysis, as required by X.1.6.1, shall include information on the following:

(1) Safety venting
(2) Thermal runaway management
(3) Spill control
(4) Neutralization
(5) Ventilation

(6) Signage
(7) Seismic protection
(8) Fire detection
(9) Fire suppression
(10) Fire-resistance separation rating; both vertical and horizontal
(11) Gas detection

X.1.5.3 Safety Features.

X.1.5.3.1Safety Venting.

X.1.5.3.1.1 Batteries shall be provided with flame arresting safety venting caps in accordance with X.7.1.1 through X.7.1.3 and Chapter 60.

X.1.5.3.1.2 Nonrecombinant batteries shall be provided with safety venting caps with flame arrestors.

X.1.5.3.1.3 Sealed, recombinant batteries shall be equipped with self-resealing flame-arresting safety vents to relieve over-pressure.

X.1.5.3.1.4 Lithium-ion and lithium metal polymer batteries shall not require safety venting caps but shall include an approved means to relieve over-pressure.

X.1.5.3.2 Thermal Runaway. Lithium-ion, and lithium metal polymer energy storage systems shall be provided with a listed device or other approved method to preclude, detect, and control conditions that can lead to a thermal runaway.

X.1.6. Stationary Battery Energy Storage Location and Occupancy Separation.

X.1.6.1 Energy storage systems shall be permitted in the same room as the equipment that they support.

X.1.6.2 Energy storage systems shall be housed in a noncombustible, locked cabinet or other enclosure to prevent access by unauthorized personnel unless located in a separate equipment room accessible only to authorized personnel.

X.1.6.3 When installed in a building situated within a flood hazard area, the location of the energy storage system systems shall be in accordance with NFPA 5000 *Building Construction and Safety Code*, Section X.2, or equivalent requirements of the locally adopted building code.

X.1.6.4 Energy storage systems in occupancies other than assembly, educational, detention and correction, health care, ambulatory health care, day care, residential board and care, and residential, energy storage systems shall be located in a room separated from other portions of the building by a minimum of a 1-hour fire barrier.

X.1.6.5 Energy storage systems in assembly, educational, detention and correction, health care, ambulatory health care, day care, residential board and care, and residential occupancies, shall be located in a room separated from other portions of the building by a minimum of a 2-hour fire barrier.

X.1.7 Spill Control.

X.1.7.1 Rooms, buildings, or areas containing free-flowing liquid electrolyte in individual vessels having a capacity of more than 55 gal (208 L) or multiple vessels having an aggregate capacity exceeding 1000 gal (3785 L) shall be provided with spill control to prevent the flow of liquids to adjoining areas.

X.1.7.2* An approved method and materials for the control of a spill of electrolyte shall be provided that will be capable of controlling a spill from the single largest vessel.

X.1.7.3 Lithium-ion, lithium metal polymer, or other types of sealed batteries with immobilized electrolyte shall not require spill control.

X.1.8 Neutralization.

X.1.8.1* An approved method to neutralize spilled corrosive electrolyte shall be provided. It shall be capable of neutralizing a spill from the largest battery to a pH between 7.0 and 9.0.

X.1.8.2 For nonrecombinant batteries, the method shall be capable of neutralizing a spill from the largest battery to a pH between 7.0 and 9.0.

X.1.8.3 Lithium-ion and lithium metal polymer batteries shall not require neutralization.

X.1.9 Ventilation.

X.1.9.1 For batteries that can vent hydrogen or other flammable gas, ventilation shall be provided for rooms and cabinets in accordance with one of the following:
(1) The ventilation system shall be designed to limit the maximum concentration of combustible gas to 25% of the LFL, or
(2) Continuous ventilation shall be provided at a rate of not less than 1 ft3/min/ft2 (5.1 L/sec/m2) of floor area of the room or cabinet.

X.1.10 Environment The battery environment shall be controlled or analyzed to maintain temperature in a safe operating range for the specific battery technology used.

X.1.11. Signage.

X.1.11.1 Signage identifying total energy storage system capacity (kWh) shall be posted on doors or in approved locations near entrances to stationary battery storage system rooms.

X.1.11.2 Approved signage indicating “danger” “warning” or “caution” shall be specific to the technology hazard of the battery type.

X.1.11.2.1 The sign shall be a minimum 8 in. (200 mm) wide and 6 in. (150 mm) high and shall include the following:

1. Hazard identification markings in accordance with NFPA 704.
2. Where the energy storage system disconnecting means is not within sight of the Main Service disconnecting means, placards or directories shall be installed at the locations of the Main Service indicating the location of all energy storage disconnecting means in accordance with NFPA 70.

X.1.11.2.2 Signs shall be provided on doors or in approved locations near entrances to stationary battery storage system rooms.

X.1.12 Seismic and structural design. Seismic and structural design shall be provided in accordance with the building code and shall not exceed the floor loading limitation of the building.

X.1.13 Fire detection. An approved automatic smoke detection system shall be installed in rooms containing *stationary battery storage systems* in accordance with NFPA 72.

X.1.14 Fire Command Centers. Buildings that require or have a fire command center shall have identified the location, size, voltage and disconnects for stationary stored energy battery systems as identified in X.1.2.

X.1.15 Fire suppression. Rooms containing *Stationary battery storage systems* shall be protected by an automatic sprinkler system installed in accordance with NFPA 13.

X.1.15.1 Commodity classifications. Commodity classifications for the storage of lithium-ion, sodium-beta, and flow batteries shall be in accordance with NFPA 13 Chapter 5.

X.1.16 Fire-resistance separation rating. Both vertical and horizontal shall be in accordance with section X.1.5.

X.1.17 Toxic and highly toxic gases. Stationary battery systems that have the potential to release in excess of 20 cubic feet (0.566 m3) of toxic or highly toxic gas at normal temperature and pressure (NTP) shall not be installed in Assembly, Educational, Institutional, Residential occupancies, or in occupied offices, retail sales and portions of Industrial and storage occupancies.

X.1.18 Mechanical ventilation. Ventilation of indoor areas containing stationary storage battery systems shall be provided in accordance with the Mechanical Code and the following:

1. The ventilation system shall be designed to limit the maximum concentration of hydrogen to 1.0 percent of the total volume of the room. For batteries that have the potential to produce other combustible gas, the ventilation system shall be designed to limit the maximum concentration of combustible gas to 25% of the LFL, or
2. Continuous ventilation shall be provided at a rate of not less than 1 cubic foot per minute per square foot (1 ft3/min/ft2) [0.0051 m3/s • m2] of floor area of the room.

X.1.19 Cabinet ventilation. Where batteries that have the potential to produce hydrogen or other combustible gases are installed inside a cabinet, the cabinet shall be approved for use in occupied spaces and shall be mechanically or naturally vented by one of the following methods:

1. The cabinet ventilation shall limit the maximum concentration of hydrogen to 1 percent of the total volume of the cabinet, or 25 % of the combustible gas LFL during the worst-case event of simultaneous “boost” charging of all the batteries in the cabinet.

2. Where calculations are not available to substantiate the ventilation rate, continuous ventilation shall be provided at a rate of not less than 1 cubic foot per minute per square foot [1 ft3/min/ft2 or 0.0051 m3/(s • m2)] of floor area covered by the cabinet. The room in which the cabinet is installed shall be ventilated as required in X.1.18.

X.1.20 Supervision. Mechanical ventilation systems, where required by X.1.19 and X.1.20 shall be supervised by an approved central station, proprietary or remote station service or shall initiate an audible and visual signal at an approved constantly attended on-site location.

X.1.21 Gas detection system. A gas detection system shall be provided to protect areas that have the potential to contain a flammable gas, toxic gas or highly toxic gas from stationary battery systems during normal charging, discharging or fault conditions. Systems designed to detect flammable gases shall activate mechanical ventilation complying with X.1.18 when the level of flammable gas exceeds 25 percent of the lower flammable limit (LFL). Systems designed to detect toxic and highly toxic gases shall comply with NFPA 55.

X.1.22 Battery Management System. A battery management system shall be provided for the control and protection of the battery. The battery management system (BMS) shall provide monitoring of cell, module and battery voltages, module and battery current and cell temperatures. The BMS shall maintain the cells and batteries within the manufacturer’s specification for current, voltage and temperature. In addition, active cell balancing shall be provided for safety of the battery energy storage system.

X.1.23 Restricted access. Provisions shall be provided to prevent access to areas and cabinets containing stationary battery storage systems by unauthorized personnel.

X.1.24 Mixed battery systems

X.1.24.1 When areas within buildings containing stationary battery storage systems include different types of batteries, the total aggregate quantities of batteries shall be determined based on the sum of percentages of actual quantities divided by the maximum allowable quantities of each battery type. If the sum of the percentages exceeds 100%, the area shall be treated as a hazardous area.

X.1.24.2 If Batteries of different chemistries are mixed in any enclosed locations they are to be approved by the fire code official based on a hazard mitigation analysis conducted in accordance with X.1.6.

X.1.25 Spacing. Batteries, prepackaged stationary battery storage systems and preengineered stationary battery storage systems shall be segregated into storage arrays not exceeding 400 KWh each. Each array shall be spaced a minimum three feet (914 mm) from other battery arrays and from walls in the storage area.

Exception: Individual arrays of prepackaged stationary battery storage systems and preengineered stationary battery storage systems encased in metal enclosures shall be permitted to not exceed 500 KWh.

X.1.26 System classification. Stationary battery storage systems shall be classified as one of the following types:
1. Batteries
2. Pre-packaged battery storage systems.
3. Pre-engineered battery storage systems

X.1.27 Chargers. Capacitor chargers shall be compatible with the capacitor system charging specifications.

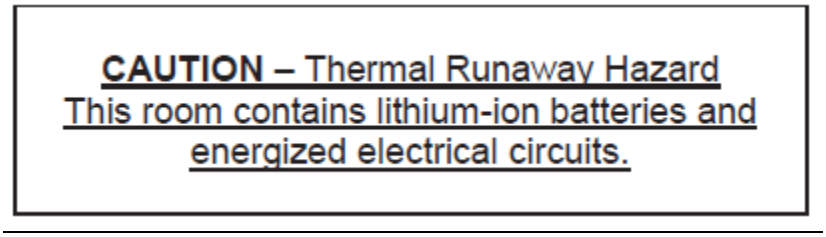
X.1.28 Inverters. Inverters shall be listed and labeled in accordance with UL 1741 or UL. UL 62109-1 Only inverters listed and labeled for utility interactive system use and identified as interactive shall be permitted to operate in parallel with the electric utility power system to supply power to common loads.

X.1.29 Battery specific protection. Stationary battery systems shall comply with Section X.1.30 requirements based on the type of battery technology utilized in the system. See Section X.1.25 for mixed battery systems.

X.1.29.1 Lithium-ion batteries.

X.1.29.1.1 Ventilation. Areas containing lithium-ion batteries shall be provided with ventilation in accordance with X.1.10.

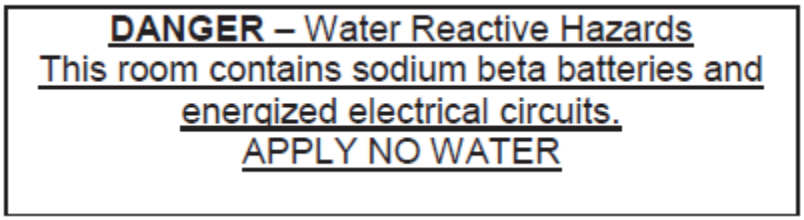
X.1.29.1.2 Signage. Signage shall be provided in accordance with X.1.12.2 and shall include the following or equivalent wording:



X.1.29.2 Sodium beta batteries.

X.1.29.2.1 Gas detection. Gas detection (SO_2) for sodium sulfur batteries shall be provided in accordance with X.1.22.

X.1.29.2.2 Signage. Signage shall be provided in accordance with X.1.12.2 and shall include the following or equivalent wording:



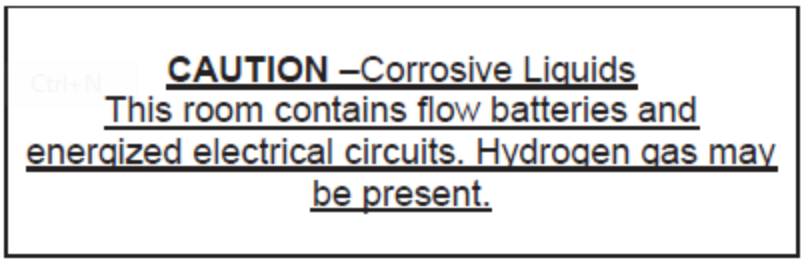
X.1.29.3 Flow batteries.

X.1.29.3.1 Spill control and neutralization. Spill control and neutralization shall be provided for areas containing flowing electrolyte storage batteries in accordance with X.1.8 and X.1.9.

X.1.29.3.2 Ventilation. Areas containing flow batteries shall be provided with ventilation in accordance withX.1.10.

X.1.29.3.3 Gas detection. Gas detection for flow batteries shall be provided in accordance with X.1.22.

X.1.29.3.4 Signage. Signage shall be provided in accordance with X.1.12.2 and shall include the following or equivalent wording:



X.1.29.4 Other battery technologies.

X.1.29.4.1 Spill control and neutralization. Spill control and neutralization shall be provided for areas containing batteries with free flowing electrolytes or other hazardous materials in liquid form in accordance with X.1.8 and X.1.9.

X.1.29.4.2 Ventilation. Areas containing batteries that have the potential to release flammable gas under charging, discharging, and fault conditions shall be provided with ventilation in accordance with Section X.1.10.

Public Comment No. 89-NFPA 1-2016 [Section No. 52.1]

52.1 * General.

~~Stationary storage~~ Stationary storage battery systems ~~having an electrolyte capacity~~ in buildings having a capacity of more than ~~100 gal (378.5 L) in sprinklered buildings or 50 gal (189.3 L) in unsprinklered buildings for~~ 70 KWh (252 MJoules) for flooded lead-acid, nickel-cadmium, and valve-regulated lead–acid (VRLA) batteries ~~or 1000 lb (454 kg) for lithium-ion and lithium metal polymer batteries~~ used for facility standby power, emergency power, or uninterrupted power supplies shall be in accordance with Chapter 52 and Table 52.1. For other battery technologies such as lithium-ion and lithium metal polymer batteries and others, see Chapter XXX(NEW).

Table 52.1 Battery Requirements

Nonrecombinant Batteries			Recombinant Batteries	
~~Other~~				
Requirement	**Flooded Lead-Acid**	**Flooded Nickel-Cadmium (Ni-Cd)**	**Valve-Regulated Lead–Acid (VRLA)**	
~~Lithium-Ion~~	~~Lithium Metal Polymer~~			
Safety caps	Venting caps	Venting caps	Self-resealing flame-arresting caps	
~~No caps~~	~~No caps~~			
Thermal runaway management		Not required	Not required	Required
~~Not required~~	~~Required~~			
Spill control	Required	Required	Not required	
~~Not required~~	~~Not required~~			
Neutralization	Required	Required	Required	
~~Not required~~	~~Not required~~			
Ventilation	Required	Required	Required	
~~Not required~~	~~Not required~~			
Signage	Required	Required	Required	
~~Required~~	~~Required~~			
Seismic control	Required	Required	Required	
~~Required~~	~~Required~~			
Fire detection	Required	Required	Required	
~~Required~~	~~Required~~			

Statement of Problem and Substantiation for Public Comment

The changes proposed include sweeping changes to an established chapter of the code that was developed over several code cycles with broad input from the major users of standby battery systems. The increased levels of protection included in the draft changes, while suitable for newer and unproven technologies such as Lithium-ion and Nickel Metal Halide or Nickel Metal Hydride, are not required for lead acid and Nickel Cadmium batteries which are well addressed in the current code and have an exemplary safety record.

Early proposals to address concerns of new technologies in Chapter 52 alluded to the possibility of including these requirements in a new chapter or sub-chapter. It is the position of telecom carriers such as Verizon and CenturyLink and others that inclusion of a new chapter or sub-chapter, with the existing Pb acid and Nickel

Cadmium requirements intact is a better approach. It is easy for the code official to determine which types of batteries are present and what part of the code is applicable. This structure prevents numerous exceptions for Pb-acid and Nickel Cadmium batteries that would otherwise be needed.

Related Item

Public Input No. 250-NFPA 1-2015 [Chapter 52 [Title Only]]

Submitter Information Verification

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Public Comment No. 91-NFPA 1-2016 [Section No. 52.3.1.3]

~~52.3.1.3~~ –

~~Lithium-ion and lithium metal polymer batteries shall not require safety venting caps.~~

Statement of Problem and Substantiation for Public Comment

The changes proposed include sweeping changes to an established chapter of the code that was developed over several code cycles with broad input from the major users of standby battery systems. The increased levels of protection included in the draft changes, while suitable for newer and unproven technologies such as Lithium-ion and Nickel Metal Halide or Nickel Metal Hydride, are not required for lead acid and Nickel Cadmium batteries which are well addressed in the current code and have an exemplary safety record.

Early proposals to address concerns of new technologies in Chapter 52 alluded to the possibility of including these requirements in a new chapter or sub-chapter. It is the position of telecom carriers such as Verizon and CenturyLink and others that inclusion of a new chapter or sub-chapter, with the existing Pb acid and Nickel Cadmium requirements intact is a better approach. It is easy for the code official to determine which types of batteries are present and what part of the code is applicable. This structure prevents numerous exceptions for Pb-acid and Nickel Cadmium batteries that would otherwise be needed.

Related Item

Public Input No. 281-NFPA 1-2015 [Section No. 52.3.1]

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Public Comment No. 92-NFPA 1-2016 [Section No. 52.3.2]

52.3.2 Thermal Runaway.

VRLA ~~, lithium-ion, and lithium metal polymer~~ battery systems shall be provided with a listed device or other approved method to preclude, detect, and control ~~thermal~~ conditions that can lead to a thermal runaway.

Statement of Problem and Substantiation for Public Comment

Delete from chapter 52 and move to a new chapter or sub-chapter requirements for lithium and other battery technologies. The revisions proposed by the technical committee include sweeping changes to an established chapter of the code that was developed over several code cycles with broad input from the major users of standby battery systems. The increased levels of protection included in the draft changes, while suitable for newer and unproven technologies such as Lithium-ion and Nickel Metal Halide or Nickel Metal Hydride, are not required for lead acid and Nickel Cadmium batteries which are well addressed in the current code and have an exemplary safety record.

Early proposals to address concerns of new technologies in Chapter 52 alluded to the possibility of including these requirements in a new chapter or sub-chapter. It is the position of telecom carriers such as Verizon and CenturyLink and others that inclusion of a new chapter or sub-chapter, with the existing Pb acid and Nickel Cadmium requirements intact is a better approach. It is easy for the code official to determine which types of batteries are present and what part of the code is applicable. This structure prevents numerous exceptions for Pb-acid and Nickel Cadmium batteries that would otherwise be needed.

Related Item

Public Input No. 250-NFPA 1-2015 [Chapter 52 [Title Only]]

Public Input No. 282-NFPA 1-2015 [Section No. 52.3.2]

Submitter Information Verification

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Public Comment No. 93-NFPA 1-2016 [Section No. 52.3.4.3]

52.3.4.3

VRLA ~~, lithium-ion, lithium metal polymer, or other types of sealed~~ batteries with immobilized electrolyte shall not require spill control.

Statement of Problem and Substantiation for Public Comment

Delete from chapter 52 and move to a new chapter or sub-chapter requirements for lithium and other battery technologies. The revisions proposed by the technical committee include sweeping changes to an established chapter of the code that was developed over several code cycles with broad input from the major users of standby battery systems. The increased levels of protection included in the draft changes, while suitable for newer and unproven technologies such as Lithium-ion and Nickel Metal Halide or Nickel Metal Hydride, are not required for lead acid and Nickel Cadmium batteries which are well addressed in the current code and have an exemplary safety record.

Early proposals to address concerns of new technologies in Chapter 52 alluded to the possibility of including these requirements in a new chapter or sub-chapter. It is the position of telecom carriers such as Verizon and CenturyLink and others that inclusion of a new chapter or sub-chapter, with the existing Pb acid and Nickel Cadmium requirements intact is a better approach. It is easy for the code official to determine which types of batteries are present and what part of the code is applicable. This structure prevents numerous exceptions for Pb-acid and Nickel Cadmium batteries that would otherwise be needed.

Related Item

Public Input No. 250-NFPA 1-2015 [Chapter 52 [Title Only]]

Submitter Information Verification

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Submittal Date: Mon May 16 13:47:28 EDT 2016

Public Comment No. 94-NFPA 1-2016 [Sections 52.3.5.2, 52.3.5.3]

Sections 52.3.5.2, 52.3.5.3

52.3.5.2

~~For nonrecombinant batteries and VRLA batteries, the~~ The method shall be capable of neutralizing a spill from the largest battery to a pH between 7.0 and 9.0.

~~52.3.5.3~~

~~Lithium-ion and lithium metal polymer batteries shall not require neutralization.~~

Statement of Problem and Substantiation for Public Comment

Delete from chapter 52 and move to a new chapter or sub-chapter requirements for lithium and other battery technologies. The revisions proposed by the technical committee include sweeping changes to an established chapter of the code that was developed over several code cycles with broad input from the major users of standby battery systems. The increased levels of protection included in the draft changes, while suitable for newer and unproven technologies such as Lithium-ion and Nickel Metal Halide or Nickel Metal Hydride, are not required for lead acid and Nickel Cadmium batteries which are well addressed in the current code and have an exemplary safety record.

Early proposals to address concerns of new technologies in Chapter 52 alluded to the possibility of including these requirements in a new chapter or sub-chapter. It is the position of telecom carriers such as Verizon and CenturyLink and others that inclusion of a new chapter or sub-chapter, with the existing Pb acid and Nickel Cadmium requirements intact is a better approach. It is easy for the code official to determine which types of batteries are present and what part of the code is applicable. This structure prevents numerous exceptions for Pb-acid and Nickel Cadmium batteries that would otherwise be needed.

Related Item

Public Input No. 250-NFPA 1-2015 [Chapter 52 [Title Only]]

Public Input No. 285-NFPA 1-2015 [Section No. 52.3.5]

Submitter Information Verification

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Public Comment No. 101-NFPA 1-2016 [Section No. 52.3.6 [Excluding any Sub-Sections]]

For flooded lead-acid, flooded nickel-cadmium, and VRLA batteries, ventilation shall be provided for rooms and cabinets in accordance with the mechanical code and one of the following:

(1) The ventilation system shall be designed to limit the maximum concentration of hydrogen to 1.0 percent of the total volume of the room during the worst-case event of simultaneous “boost” charging of all the batteries, in accordance with nationally recognized standards.

(2) Continuous ventilation shall be provided at a rate of not less than 1 $ft^3/min/ft^2$ (5.1 $L/sec/m^2$) of floor area of the room or cabinet.

COMMENT: This original wording provides both calculated ventilation based on battery off-gassing data as well as an ultra-conservative high ventilation rate in the event no battery data is available. This existing wording covers ventilation criteria. New committee proposal CI-137 sections 52.1.10.1 and 52.1.19 seem to have the same wording where 52.1.10.1 requires ventilation and 52.1.19 may require mechanical ventilation. Many battery rooms are designed with volume and natural ventilation to prevent hydrogen levels from reaching 1% (25% of the LFL) through diffusion and natural convection.

Statement of Problem and Substantiation for Public Comment

The existing Chapter 52 ventilation criteria accurately provides two methods for hydrogen or flammable gas control. This original wording provides both calculated ventilation based on battery off-gassing data as well as an ultra-conservative high ventilation rate in the event no battery data is available. This existing wording covers ventilation criteria. New committee proposal CI-137 sections 52.1.10.1 and 52.1.19 seem to have the same wording where 52.1.10.1 requires ventilation and 52.1.19 may require mechanical ventilation. Many battery rooms are designed with volume and natural ventilation to prevent hydrogen levels from reaching 1% (25% of the LFL) through diffusion and natural convection.

Related Item

Committee Input No. 137-NFPA 1-2015 [Chapter 52]

Submitter Information Verification

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Public Comment No. 102-NFPA 1-2016 [Section No. 52.3.6 [Excluding any Sub-Sections]]

For flooded lead-acid, flooded nickel-cadmium, and VRLA batteries, ventilation shall be provided for rooms and cabinets in accordance with the mechanical code and one of the following:

(1) The ventilation system shall be designed to limit the maximum concentration of hydrogen to 1.0 percent of the total volume of the room during the worst-case event of simultaneous “boost” charging of all the batteries, in accordance with nationally recognized standards.

(2) Continuous ventilation shall be provided at a rate of not less than 1 $ft^3/min/ft^2$ (5.1 $L/sec/m^2$) of floor area of the room or cabinet.

COMMENT: Committee Input 137 adds the following for ventilation supervision: **52.1.21. Supervision.** Mechanical ventilation systems, where required by 52.1.19 and 52.1.20 shall be supervised by an approved central station, proprietary or remote station service or shall initiate an audible and visual signal at an approved constantly attended on-site location. If accepted revise as follows:

52.1.21. Supervision. Mechanical ventilation systems, where required by 52.1.19 and 52.1.20 shall be supervised by an approved central station, proprietary or remote station service **or by a monitored building environmental control system and** shall initiate an audible and visual signal at an approved constantly attended location.

Statement of Problem and Substantiation for Public Comment

Many telecommunications facilities utilize building environmental control monitoring systems where alarms or problems with the HVAC system are sent to Network Operations Centers that are staffed 24x7x365. These alarms would indicate a problem where room temperatues or other parameters indicate a ventilaton problem or other battery room anomaly. Furthermore, the build-up of hydrogen in a room is a slow event (days or weeks unattended if at all) so these systems would provide more than ample time to dispatch technicians to the site to address the ventilation or battery problem.

Related Item

Committee Input No. 137-NFPA 1-2015 [Chapter 52]

Submitter Information Verification

Submitter Full Name: Randy Schubert
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Submittal Date: Mon May 16 16:24:45 EDT 2016

Public Comment No. 95-NFPA 1-2016 [Section No. 52.3.6.1]

~~52.3.6.1~~ –

~~Lithium-ion and lithium metal polymer batteries shall not require ventilation.~~

Statement of Problem and Substantiation for Public Comment

Delete from chapter 52 and move to a new chapter or sub-chapter requirements for lithium and other battery technologies. The revisions proposed by the technical committee include sweeping changes to an established chapter of the code that was developed over several code cycles with broad input from the major users of standby battery systems. The increased levels of protection included in the draft changes, while suitable for newer and unproven technologies such as Lithium-ion and Nickel Metal Halide or Nickel Metal Hydride, are not required for lead acid and Nickel Cadmium batteries which are well addressed in the current code and have an exemplary safety record.

Early proposals to address concerns of new technologies in Chapter 52 alluded to the possibility of including these requirements in a new chapter or sub-chapter. It is the position of telecom carriers such as Verizon and CenturyLink and others that inclusion of a new chapter or sub-chapter, with the existing Pb acid and Nickel Cadmium requirements intact is a better approach. It is easy for the code official to determine which types of batteries are present and what part of the code is applicable. This structure prevents numerous exceptions for Pb-acid and Nickel Cadmium batteries that would otherwise be needed.

Related Item

Public Input No. 250-NFPA 1-2015 [Chapter 52 [Title Only]]

Public Input No. 287-NFPA 1-2015 [Section No. 52.3.6]

Submitter Information Verification

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Submittal Date: Mon May 16 13:55:43 EDT 2016

Public Comment No. 96-NFPA 1-2016 [Section No. 52.3.8.2]

52.3.8.2

For rooms that contain Valve-Regulated Lead–Acid (VRLA) ~~, Lithium-Ion, or Lithium Metal Polymer~~ batteries, the signs required by 52.3.8.1 shall state the following:

This room contains:

(1) Stationary storage battery systems

(2) Energized electrical circuits

Statement of Problem and Substantiation for Public Comment

Delete from chapter 52 and move to a new chapter or sub-chapter requirements for lithium and other battery technologies. The revisions proposed by the technical committee include sweeping changes to an established chapter of the code that was developed over several code cycles with broad input from the major users of standby battery systems. The increased levels of protection included in the draft changes, while suitable for newer and unproven technologies such as Lithium-ion and Nickel Metal Halide or Nickel Metal Hydride, are not required for lead acid and Nickel Cadmium batteries which are well addressed in the current code and have an exemplary safety record.

Early proposals to address concerns of new technologies in Chapter 52 alluded to the possibility of including these requirements in a new chapter or sub-chapter. It is the position of telecom carriers such as Verizon and CenturyLink and others that inclusion of a new chapter or sub-chapter, with the existing Pb acid and Nickel Cadmium requirements intact is a better approach. It is easy for the code official to determine which types of batteries are present and what part of the code is applicable. This structure prevents numerous exceptions for Pb-acid and Nickel Cadmium batteries that would otherwise be needed.

Related Item

Public Input No. 250-NFPA 1-2015 [Chapter 52 [Title Only]]

Public Input No. 291-NFPA 1-2015 [New Section after 52.3.8.3]

Submitter Information Verification

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Public Comment No. 98-NFPA 1-2016 [Section No. 52.3.10]

52.3.10 Smoke Detection.

An approved automatic smoke detection system shall be installed in such areas and supervised by an approved central, proprietary, or remote station service or a local alarm that will give an audible signal at a constantly attended location.

Exception: Small stand-alone telecommunications structures with a gross floor area of less than 1,500 square feet such as walk-in cabinets, on-grade huts, cell huts and controlled environmental vaults.

Statement of Problem and Substantiation for Public Comment

There are thousands of small stand-alone one or two room telecommunications structures across the nation that at are unmanned and do not impact the emergency or stand-by power supplies for an occupied structure. The requirement for providing smoke detection in all these facilities is not justifiable as there is no fire loss history to support this requirement based upon the presence of batteries in this structure. Battery incident fires in facilities of this nature is believed to be less than 10 per calendar year. Often the telecommunications equipment provider may provide one single station smoke detector monitored by the providers service center. NFPA 76, Standard for the Fire Protection of Telecommunications Equipment Facilities, 2016 edition does not require smoke detection per Chapter 11 of the standard.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 90-NFPA 1-2016 [Chapter 52]	AddressvPublic Input and specifically 52.3.10

Related Item

Committee Input No. 137-NFPA 1-2015 [Chapter 52]

Submitter Information Verification

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Submittal Date: Mon May 16 14:34:52 EDT 2016

Public Comment No. 21-NFPA 1-2016 [New Section after A.10.10.9.1]

A.10.10.10

A hazardous condition is intended to include any fire that generates smoke or products of combustion that may obstruct visibilty in traffic, create health issues, damage property or contribute to conditions that create property, safety or health hazards. As numerous variables may go into this determination, the Authority Having Jurisdiction will need to evaluatate each situation on a case-by-case basis.

Statement of Problem and Substantiation for Public Comment

PI 123 raised an issue regarding the creation of a "nuisance." While the TC rightfully rejected the PI, the proposer did raise a valid concern that the code could provide additional clarity as to what constitutes a potential hazardous condition under this section. The proposed annex text attempts to provide that added clarity while also confirming that these determinations will need to be made on a case-by-case basis.

Related Item

Public Input No. 124-NFPA 1-2015 [Section No. 10.10.10]

Submitter Information Verification

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Public Comment No. 18-NFPA 1-2016 [Section No. A.18.4.3.1.1]

A.18.4.3.1.1

The intent of 18.4.3.1.1 is to provide some limited flexibility in those circumstances where there is no water supply available and the fire department's capabilities to deliver water via a tanker shuttle or drafting operation are also limited. The AHJ should consider establishing additional conditions, such as those contained in 18.4.3.1.2, prior to permitting decreased fire flow capability. While NFPA 1 does not provide a definition for rural or suburban, NFPA 1142 does. The AHJ can utilize the following definitions for NFPA 1142 as guidance for the application of the terms rural and suburban within this Code:

Rural: Those areas that are not unsettled wilderness or uninhabitable territory but are sparsely populated with densities below 500 persons per square mile (1142)

Suburb or Suburban: Those moderately inhabited areas with population densities of at least 500 persons per square mile but less than 1000 persons per square mile. (1142)

Statement of Problem and Substantiation for Public Comment

In lieu of adopting these definitions into chapter 3 of NFPA 1 as proposed by PI 24 and PC 17, guidance can be provided to the AHJ in the annex text of this section. Although not code text, this guidance will help the AHJ in the proper application of this section by providing criteria to judge if a property is in a rural or suburban area. This is an alternative to PC 17.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 17-NFPA 1-2016 [New Section after 3.3.281]	PC 18 is alternative language to PC 17.

Related Item

Public Input No. 24-NFPA 1-2015 [New Section after 3.3.277]

Submitter Information Verification

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Public Comment No. 68-NFPA 1-2016 [Section No. A.34.10.4.1]

A.34.10.4.1

Pallets staged outdoors at pallet manufacturing and recycling facilities should not be defined as idle (not active or not in use) considering that these facilities stage work-in-process pallets in an active management environment according to the following:

(1) Pallets are the primary business activity at these manufacturing and recycling facilities.

(2) Pallet inventories are organized in a specific manner based on size and quality.

(3) Pallet inventories are rotated on a routine basis.

(4) Personnel are a frequent presence in the staging area during hours of operation.

Combustible pallets listed and labeled to ANSI/FM 4996, or to UL 2335, should be treated as wood pallets for determining sprinkler protection.

(Also, add ANSI/FM 4996, Approval Standard for Classification of Pallets and Other Material Handling Products as Equivalent to Wood Pallets, 2013, and UL 2335, Standard for Fire Tests of Storage Pallets, 2010, to the Annex on Informational References)

Statement of Problem and Substantiation for Public Comment

This just adds the appropriate references for fires tests for listing of combustible pallets.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 67-NFPA 1-2016 [Section No. 34.10.4.1]	

Related Item

First Revision No. 159-NFPA 1-2015 [Sections 34.10.3, 34.10.4]

Submitter Information Verification

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Public Comment No. 100-NFPA 1-2016 [Sections A.40.3.2.1.1, A.40.3.2.1.3, A.40.3.2.1.4, A.40.3.2...]

Sections

A.40.

3.2.1.1, A.40.3.2.1.3, A.40.3.2.1.4, A.40.3.2.2.4, A.40.3.2.2.5, A.40.3.2.3.1, A.40.3.2.3.1(6), A.40.4.1.2.3, A.40.4

A.40.3.2.1.1 —

Housekeeping for fugitive dusts is most important where the operational intent is that the dust accumulations are not normally present in the occupancy and the building has no deflagration protection features, such as damage limiting/explosion venting construction or classified electrical equipment, and additional personal protection from dust deflagration hazards is not provided. Factors that should be considered in establishing the housekeeping frequency include the following:

(1) - Variability of fugitive dust emissions

(2) - Impact of process changes and non-routine activities

(3) - Variability of accumulations on different surfaces within the room (walls, floors, overheads)

[**654:** A.8.2.1.1]

A.40.3.2.1.3 —

Unscheduled housekeeping should be performed in accordance with Table A.40.3.2.1.3(a) to limit the time that a local spill or short-term accumulation of dust is allowed to remain before the local area is cleaned to less than the threshold dust mass/accumulation. Table A.40.3.2.1.3(b) shows approximate equivalent depths for the accumulation values in Table A.40.3.2.1.3(a) when the threshold dust mass/accumulation is 0.2 lb/ft $^{-2}$ (1 kg/m $^{-2}$). The owner/operator can use an approximate depth to facilitate communication of housekeeping needs. [**654:** A.8.2.1.3]

Table A.40.3.2.1.3(a) Unscheduled Housekeeping

Accumulation on the Worst Single Square Meter of Surface - **Longest Time to Complete Unscheduled Local Cleaning of Floor-Accessible Surfaces** - **Longest Time to Complete Unscheduled Local Cleaning of Remote Surfaces** - > 1 to 2 times threshold dust mass/accumulation 8 hours 24 hours >2 to 4 times threshold dust mass/accumulation 4 hours 12 hours >4 times threshold dust mass/accumulation 1 hour 3 hours

[**654:** Table A.8.2.1.3(a)]

Table A.40.3.2.1.3(b) Unscheduled Housekeeping

Accumulation on the Worst Single Square Meter of Surface - **Average Depth at 75 lb/ft ^{3} (1200 kg/m ^{3})**) - **Average Depth at 30 lb/ft ^{3} (481 kg/m ^{3})** - >0.2–0.4 lb/ft ^{2} (>1 to 2 kg/m ^{2}) > $^1/_{32}$ – $^1/_{16}$ in. (0.8-1.7 mm) > $^5/_{64}$ – $^5/_{32}$ in. (2.1–4.2 mm) >0.4–0.8 lb ft ^{2} (>2 to 4 kg/m ^{2}) > $^1/_{16}$ – $^1/_8$ in. (1.7–3.3 mm) > $^5/_{32}$ – $^5/_{16}$ in. (4.2–8.3 mm) >0.8 lb/ft ^{2} (> 4 kg/m ^{2}) > $^1/_8$ in. (>3.3 mm) > $^5/_{16}$ in. (>8.3 mm)

[**654:** Table A.8.2.1.3(b)]

A.40.3.2.1.4 —

When the facility is intended to be operated with more than the dust accumulation defined by the owner/operator's chosen criterion in Section 6.1 of NFPA 654, additional protective measures are necessary. This is a concept similar to the maximum allowable quantities established in the building codes. [**654:** A.8.2.1.4]

A.40.3.2.2.4 —

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 for the specific conditions under which compressed air is being used. [**654:** A.8.2.2.4]

A.40.3.2.2.5 —

Items that should be included in the housekeeping procedure include the following:

(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) - 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, and so forth

[**654:** A.8.2.2.5]

A.40.3.2.3.1 —

If a large quantity of material is spilled in an unclassified area, the bulk material should be collected by sweeping, by shoveling, or with a portable vacuum cleaner listed as suitable for Class II locations. Vacuum cleaners meeting the requirements in 40.3.2.3.2 can be used to clean up residual material after the bulk of the spill has been collected. [**654:** A.8.2.3.1]

These requirements for portable vacuum cleaners should be applied to the use of vacuum trucks for combustible dust as well. However, there can be other safety issues concerning vacuum truck applications that are not covered within this section. Given that this application might represent a change from normal procedures, operators should also consider the guidance found in conducting a management of change evaluation. [**654:** A.8.2.3.1]

A.40.3.2.3.1(6) —

Liquids or wet material can weaken paper filter elements, causing them to fail, which can allow combustible dust to reach the fan and motor. [**654:** A.8.2.3.1(6)]

~~A.40.4.1.2.3~~ —

Specific attention should be paid to combustible particulate solids where they are introduced into the process stream. Some sources of particulate could include stone, tramp iron, other metallic contaminants, and already burning material. Before a risk management strategy is adopted, both the particulate and the process equipment have to be carefully evaluated. [**654:** A.9.1.2.3]

See Figure A.40.4.1.2.3(a) and Figure A.40.4.1.2.3(b) for examples of foreign material removal. [**654:** A.9.1.2.3]

Figure A.40.4.1.2.3(a) Pneumatic Separator. [654: Figure A.9.1.2.3(a)]

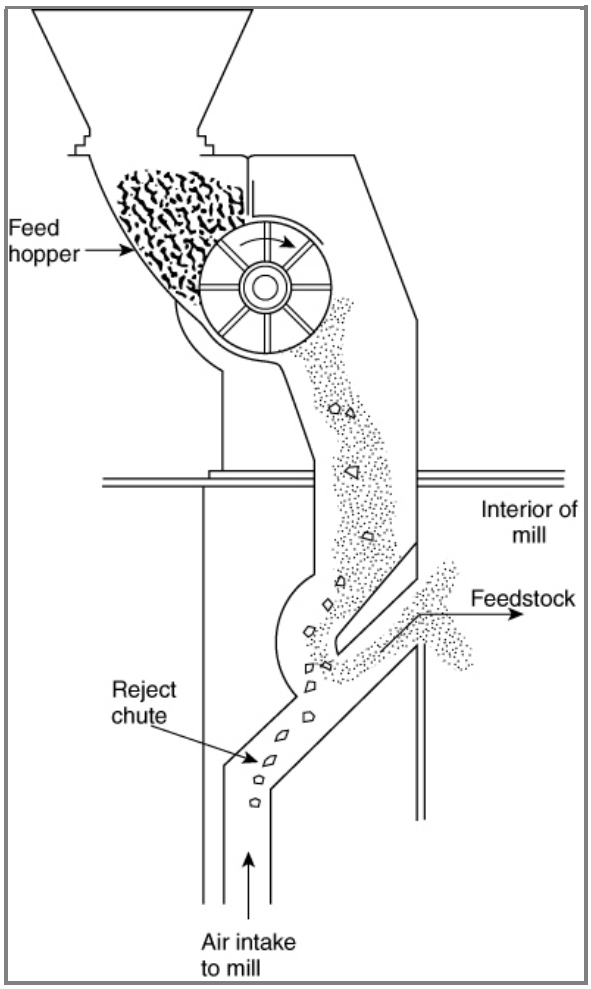
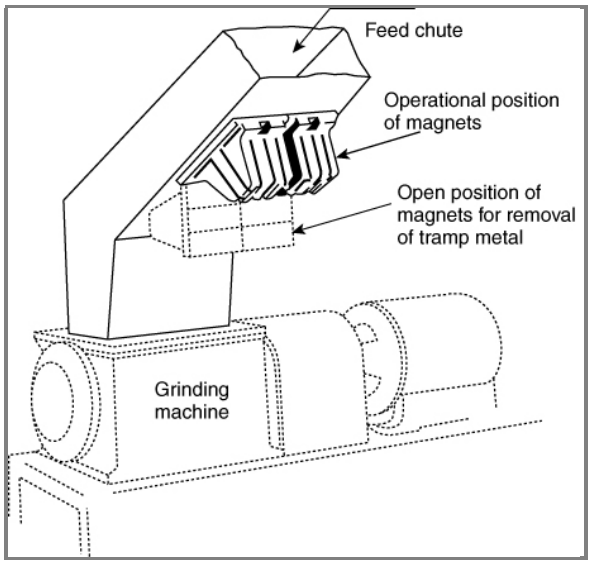


Figure A.40.4.1.2.3(b) Magnetic Separator. [654: Figure A.9.1.2.3(b)]



A.40.4.1.3 —

If the particulate particle size range includes dusts that can attain concentrations capable of propagating a flame front through a fuel–air mixture, the risk management options in 40.4.1.3 are appropriate. Conversely, if the analysis indicates that the particle size and concentration do not predict a propagating flame front through the fuel–air mixture, the fire protection methods in Chapter 10 of NFPA 654 should be considered. [**654:** A.9.1.3]

A.40.4.1.4 —

Transmission of power by direct drive should be used, where possible, in preference to belt or chain drives. [**654:** A.9.1.4]

A.40.4.1.5 —

Consideration should be given to the potential for overheating caused by dust entry into bearings. Bearings should be located outside the combustible dust stream, where they are less exposed to dust and more accessible for inspection and service. Where bearings are in contact with the particulate solids stream, sealed or purged bearings are preferred. [**654:** A.9.1.5]

A.40.4.3.2 —

Bonding minimizes the potential difference between conductive objects. Grounding minimizes the potential difference between objects and ground. [**654:** A.9.3.2]

A.40.4.3.2.2(5) —

The potential for propagating brush discharges exists where nonconductive materials with breakdown voltages exceeding 4 kV are exposed to processes that generate strong surface charges such as pneumatic conveying. Such discharges do not occur where the breakdown voltage is less than 4 kV. [**654:** A.9.3.2.2(5)]

A.40.4.3.2.3 —

Where the bonding/grounding system is all metal, resistance in continuous ground paths is typically less than 10 ohms. Such systems include those having multiple components. Greater resistance usually indicates that the metal path is not continuous, usually because of loose connections or corrosion. A grounding system that is acceptable for power circuits or for lightning protection is more than adequate for a static electricity grounding system. [**654:** A.9.3.2.3]

A.40.4.3.4 —

A more detailed description of FIBC ignition hazards can be found in IEC 61340-4-4, *Electrostatics — Part 4-4: Standard Test Methods for Specific Applications—Electrostatic Classification of Flexible Intermediate Bulk Containers* (FIBC). [**654:** A.9.3.4]

A.40.4.3.4.1 —

Induction charging of ungrounded conductive objects, including personnel, should be addressed as part of the process hazard analysis. The process hazard analysis should also consider that higher rates of transfer into and out of the FIBC increase the rate of charge generation. Consideration should also be given to the possibility of surface (cone) discharges while the FIBC is being filled, regardless of FIBC type. For additional information on these phenomena, refer to NFPA 77. The use of internal liners in FIBCs can introduce additional electrostatic ignition hazards and should be subject to expert review prior to use. [**654:** A.9.3.4.1]

A.40.4.3.4.2.2 —

For this application, conductive particulate solids typically are those materials having bulk resistivity <10^6 ohm-m. [**654:** A.9.3.4.2.2]

A.40.4.3.4.3.2 —

See A.40.4.3.4.2.2 . [**654:** A.9.3.4.3.2]

A.40.4.3.4.6 —

Table A.40.4.3.4.6 provides a useful guide for the selection and use of FIBCs based on the MIE of product contained in the FIBC and the nature of the atmosphere surrounding it. [**654:** A.9.3.4.6]

Table A.40.4.3.4.6 Use of Different Types of FIBCs

Bulk Product in FIBC Surroundings MIE of Solids [a] - Nonflammable Atmosphere Class II, Divisions 1 and 2 (1,000 mJ ≥ MIE > 3 mJ) [a] - Class I, Divisions 1 and 2 (Gas Group C and D) or Class II, Divisions 1 and 2 (MIE ≤ 3 mJ) [a] - MIE > 1000 mJ A, B, C, D B, C, D C, D [b] - 1000 mJ ≥ MIE > 3 mJ B, C, D B, C, D C, D [b] MIE ≤ 3 mJ C, D C, D C, D [b]

(1) Additional precautions usually are necessary when a flammable gas or vapor atmosphere is present inside the FIBC, e.g., in the case of solvent wet solids.

(2) Nonflammable atmosphere includes combustible particulate solids having a MIE >1000 mJ.

(3) FIBC Types A, B, and D are not suitable for use with conductive combustible particulate solids.

[a] Measured in accordance with ASTM E2019, capacitive discharge circuit (no added inductance).

[b] Use of Type C and D is limited to Gas Groups C and D with MIE ≥ 0.14 mJ.

[**654:** Table A.9.3.4.6]

A.40.4.3.4.7 —

In special cases it may be necessary to use a type of FIBC that is not permitted for the intended application based on the requirements of 40.4.3.4 . For such cases, it might be determined that the FIBC is safe to use provided that filling or emptying rates are restricted in order to limit electrostatic charging. In the case of conductive combustible particulate solids, the use of a Type A FIBC might be acceptable provided that the maximum ignition energy from the FIBC or charged product within it is less than the MIE of the combustible particulate solids. [**654:** A.9.3.4.7]

A.40.4.3.5.1 —

Conductive containers are generally made from either metal or carbon-filled plastic having a volume resistivity less than 10^6 ohm-m. [**654:** A.9.3.5.1]

A.40.4.3.5.2 —

Induction charging of ungrounded conductive objects, including personnel, should be addressed as part of the risk evaluation and process hazard analysis when the use of nonconductive RIBC is being considered. The risk evaluation should also consider that higher rates of transfer into and out of the RIBC increase the rate of charge generation, which could result in the propagation of brush discharges or surface (cone) discharges while the RIBC is being filled. For additional information on these phenomena, refer to NFPA 77. [**654:** A.9.3.5.2]

A.40.4.3.7 —

See NFPA 77 for recommended practices on manual additions of solids into vessels containing flammable atmospheres, including recommended practices on the grounding of personnel. [**654:** A.9.3.7]

A.40.4.3.7.1 —

For example, metal chimes on fiber drums should be grounded. For uncoated fiber drums, grounding one chime might be sufficient. Where contact with a grounded operator is used to ground the container (such as with static-dissipative bags), it is important that gloves, if used, be static-dissipative and free of contaminants. [**654:** A.9.3.7.1]

A.40.4.3.7.4 —

Examples of auxiliary loading devices include shovels, scoops, and funnels. Conductive tools can be grounded through a properly grounded operator. See also A.40.4.3.7.1 for guidance related to grounding of containers. [**654:** A.9.3.7.4]

A.40.4.3.7.5 —

Where static-dissipative footwear is used for personnel grounding, the floor resistance to ground should be between 106 and 109 ohms. Care should be taken to ensure that deposits, residues, and coatings that build up over time do not impair grounding between the floor and personnel. [**654:** A.9.3.7.5]

A.40.4.3.7.7 —

A risk evaluation should address considerations such as container construction, properties of the solids, properties of the liquid, addition rate, material construction of the receiving vessel, agitating devices, and intensity of agitation. The risk evaluation should identify the necessary engineering and administrative controls to ensure that the potential charge accumulation during dumping of the contents will not produce a discharge that exceeds the MIE of the flammable atmosphere within the vessel. [**654:** A.9.3.7.7]

A.40.4.6.1 —

Heating by indirect means is less hazardous than by direct means and is therefore preferred. Improved protection can be provided for direct-fired dryers by providing an approved automatic spark detection and extinguishing system. [**654:** A.9.6.1]

A.40.4.7 —

This section does not apply to electrical equipment; that topic is addressed in 6.5.2 of NFPA 654. Dust layer and dust cloud ignition temperatures should be determined by ASTM E2021, *Test Method for Hot-Surface Ignition Temperature of Dust Layers* ; ASTM E1491, *Test Method for Minimum Autoignition Temperature of Dust Clouds* ; or other recognized test methods acceptable to the AHJ. Normally the minimum ignition temperature of a layer of a specific dust is lower than the minimum ignition temperature of a cloud of that dust; however, this is not universally true [see NFPA 499]. The minimum ignition temperature typically decreases with increasing layer thickness, and testing up to maximum layer thickness to be expected on external surfaces is recommended. [**654:** A.9.7]

The ignition temperature of a layer of dust on hot surfaces could decrease over time if the dust dehydrates or carbonizes. For organic dusts that can dehydrate or carbonize, the temperature should not exceed the lower of the ignition temperature or 329°F (165°C). The ignition temperatures for many materials are shown in NFPA 499. [**654:** A.9.7]

A.40.4.8.2 —

Diesel-powered front-end loaders suitable for use in hazardous locations have not been commercially available. The following provisions can be used to reduce the fire hazard from diesel-powered front-end loaders used in Class II hazardous areas as defined in Article 500 of NFPA 70:

(1) - Only essential electrical equipment should be used, and wiring should be in metal conduit. Air-operated starting is preferred, but batteries are permitted to be used if they are mounted in enclosures rated for Type EX hazardous areas.

(2) - Where practical, a water-cooled manifold and muffler should be used.

(3) - Loaders that are certified to meet the Mine Safety and Health Administration (MSHA) criteria (formerly Schedule 31) found in 30 CFR 36, "Approved Requirements for Permissible Mobile Diesel-Powered Transportation Equipment," are also acceptable in lieu of A.40.4.8.2(1) and A.40.4.8.2(2) .

(4) - The engine and hydraulic oil compartments should be protected with fixed, automatic dry-chemical extinguishing systems.

(5) - Loaders should have a high degree of maintenance and cleaning. Frequent cleaning (daily in some cases) of the engine compartment with compressed air could be necessary. Periodic steam cleaning also should be done.

(6) - Loaders should never be parked or left unattended in the dust explosion hazard or dust fire hazard area.

[**654:** A.9.8.2]

A.40.5.2.1 —

Pneumatic conveying systems that move combustible particulate solids can be classified as water compatible, water incompatible, or water reactive. Inasmuch as water is universally the most effective, most available, and most economical extinguishing medium, it is helpful to categorize combustible particulate solids in relation to the applicability of water as the agent of choice. For details on use of water as an extinguishing agent, see Annex F of NFPA 654 for more information on use of water as extinguishing agent for combustible particulate solid. [**654:** A.10.2.1]

A.40.5.3.2 —

Extreme care should be employed in the use of portable fire extinguishers in facilities where combustible dusts are present. The rapid flow of the extinguishing agent across or against accumulations of dust can produce a dust cloud. When a dust cloud is produced, there is always a deflagration hazard. In the case of a dust cloud produced as a result of fire fighting, the ignition of the dust cloud and a resulting deflagration are virtually certain. [**654:** A.10.3.2]

Consequently, when portable fire extinguishers are used in areas that contain accumulated combustible dusts *(refer to A.6.2.3.1 of NFPA 654)* , the extinguishing agent should be applied in a manner that does not disturb or disperse accumulated dust. Generally, fire extinguishers are designed to maximize the delivery rate of the extinguishing agent to the fire. Special techniques of fire extinguisher use should be employed to prevent this inherent design characteristic of the fire extinguisher from producing an unintended deflagration hazard. [**654:** A.10.3.2]

A.40.5.4.2.1 —

A nozzle listed or approved for use on Class C fires produces a fog discharge pattern that is less likely than a straight stream nozzle to suspend combustible dust, which could otherwise produce a dust explosion potential. [**654:** A.10.4.2.1]

A.40.5.4.2.2 —

Fire responders should be cautioned when using straight stream nozzles in the vicinity of combustible dust accumulations that dust clouds can be formed and can be ignited by any residual smoldering or fire. [**654:** A.10.4.2.2]

A.40.5.5 —

Automatic sprinkler protection in air-material separators, silos, and bucket elevators should be considered. Considerations should include the combustibility of the equipment, the combustibility of the material, and the amount of material present. [**654:** A.10.5]

A.40.5.5.1 —

A risk evaluation should consider the presence of combustibles both in the equipment and in the area around the process. Considerations should include the combustibility of the building construction, the equipment, the quantity and combustibility of process materials, the combustibility of packaging materials, open containers of flammable liquids, and the presence of dusts. Automatic sprinkler protection in air-material separators, silos, and bucket elevators should be considered. [**654:** A.10.5.1]

A.40.5.9.1 —

Impairments can include isolating of fire pump controllers, closing of sprinkler system control valves, and isolating and disabling or disconnecting of detection, notification, and suppression systems. [**654:** A.10.9.1]

A.40.5.9.2 —

The impairment procedure consists of identifying the impaired system and alerting plant personnel that the protection system is out of service. [**654:** A.10.9.2]

A.40.5.9.3 —

The facility manager is responsible for ensuring that the condition causing the impairment is promptly corrected. [**654:** A.10.9.3]

A.40.5.9.4 —

When the impairment notification procedure is used, it provides for follow-up by the relevant authorities having jurisdiction. This follow-up helps to ensure that impaired fire and explosion protection systems are not forgotten. When the system is closed and reopened, most companies notify their insurance company, their broker, or the AHJ by telephone or other predetermined method. [**654:** A.10.9.4]

A.40.6.2.2 —

Where a dust explosion hazard or dust flash fire hazard exists, flame-resistant garments provide a measure of protection for exposed personnel. [**654:** A.11.2.2]

A.40.6.3.2(8) —

All plant personnel, including management, supervisors, and maintenance and operating personnel, should be trained to participate in plans for controlling plant emergencies. Trained plant fire squads or fire brigades should be maintained. [**654:** A.11.3.2(8)]

The emergency plan should contain the following elements:

(1) - A signal or alarm system

(2) - Identification of means of egress

(3) - Minimization of effects on operating personnel and the community

(4) - Minimization of property and equipment losses

(5) - Interdepartmental and interplant cooperation

(6) - Cooperation of outside agencies

(7) - The release of accurate information to the public

[**654:** A.11.3.2(8)]

Emergency drills should be performed annually by plant personnel. Malfunctions of the process should be simulated and emergency actions undertaken. Disaster drills that simulate a major catastrophic situation should be undertaken periodically with the cooperation and participation of public fire, police, and other local community emergency units and nearby cooperating plants. [**654:** A.11.3.2(8)]

A.40.6.5.1.1 —

Qualified contractors should have proper credentials, which include applicable American Society of Mechanical Engineers (ASME) stamps and professional licenses. [**654:** A.11.5.1.1]

A.40.6.5.4 —

It is suggested that annual meetings be conducted with regular contractors to review the facility's safe work practices and policies. Some points to cover include to whom the contractors would report at the facility, who at the facility can authorize hot work or fire protection impairments, and smoking and nonsmoking areas. [**654:** A.11.5.4]

A.40.7.1.2(5) —

Process interlocks should be calibrated and tested in the manner in which they are intended to operate, with written test records maintained for review by management. Testing frequency should be determined in accordance with the AIChE *Guidelines for Safe Automation of Chemical Processes* . [**654:** 12.1.2(5)]

A.40.7.2.2.4 —

Periodic cleaning of components is especially important if the blower or fan is exposed to heated air. [**654:** A.12.2.2.4]

A.40.7.2.2.5 —

If rust is allowed to form on the interior steel surfaces, it is only a matter of time before an iron oxide (rust) becomes dislodged and is taken downstream, striking against the duct walls. In some cases, this condition could cause an ignition of combustibles within the duct. The situation worsens if aluminum paint is used. If the aluminum flakes off or is struck by a foreign object, the heat of impact could be sufficient to cause the aluminum particle to ignite, thereby initiating a fire downstream. [**654:** A.12.2.2.5]

A.40.7.2.5.3 —

For information on maintenance of deflagration venting, see NFPA 68. [**654:** A.12.2.5.3]

4 See ANSI/AIHA Z10-2012, Occupational Health and Safety Management Systems. [652:A.9.2]

A.40.5.1 The operating procedures should address both the normal operating conditions and the safe operating limits. Where possible, the basis for establishing the limits and the consequences of exceeding the limits should also be described.

The operating procedures should address all aspects of the operation, including the following (as applicable):

(1) Normal startup
(2) Continuous operation
(3) Normal shutdown
(4) Emergency shutdown
(5) Restart after normal or emergency shutdown
(6) Anticipated process upset conditions
(7) System idling

For manual operations, the procedures and practices should describe techniques, procedural steps, and equipment that are intended to minimize or eliminate combustible dust hazards.

Operating procedures and practices should be reviewed on a periodic basis, typically annually, to ensure they are current and accurate.
[652:A.9.3.1]

A.40.5.2 Safe work practices include, but are not limited to, hot work, confined space entry, and lockout/tagout, and the use of personal protective equipment. (See NFPA 51B.) Consideration for extending the duration of the fire watch could be warranted based on characteristics of the material, equipment configuration, and conditions. For example, the PRB Coal Users' Group practice for hot work suggests fire watches could be warranted for 2 to 12 hours following the completion of hot work due to the exothermic chemical reaction of subbituminous coals. In addition to the hazards of combustible dust, safe work practices should address the hazards of mitigation systems such as inerting and suppression.
[652:A.9.3.2]

A.40.6.1 Process interlocks and protection systems should be inspected, calibrated, and tested in the manner in which they are intended to operate, with written records maintained for review. In this context, "test" implies a nondestructive means of verifying that the system will operate as intended. For active explosion protection systems, this can involve the disconnection of final elements (i.e., suppression discharge devices or fast-acting valve actuators) and the use of a simulated signal to verify the correct operation of the detection and control system. Testing can also include slow-stroke activation of fast acting valves to verify unrestricted travel. Some devices, such as explosion vent panels, suppression discharge devices, and some fast-acting valve actuators, cannot be functionally "tested" in a nondestructive manner, and so only periodic, preventive, and predictive inspection, maintenance, and replacement (if necessary) are applied.

Inspection and maintenance requirements for explosion vents and other explosion protection systems are found in NFPA 68, and NFPA 69, respectively.
[652:A.9.4.1]

A.40.6.2(5) Process interlocks should be calibrated and tested in the manner in which they are intended to operate, with written test records maintained for review by management. Testing frequency should be determined in accordance with the AIChE Guidelines for Safe Automation of Chemical Processes.[654: A.12.1.2(5)] [652:A.9.4.2(5)]

A.40.6.4 Corrective actions should be expedited on high-risk hazards (those that could result in a fatality or serious injury). Where in-kind repairs cannot be promptly implemented, consideration should be given to providing alternate means of protection. [652:A.9.4.4]

A.40.6.5 See Section 9.10 for information regarding document retention. [652:A.9.4.5]

A.40.7.1 Safety of a process depends on the employees who operate it and the knowledge and

understanding they have of the process. It is important to maintain an effective and ongoing training program for all employees involved. Operator response and action to correct adverse conditions, as indicated by instrumentation or other means, are only as good as the frequency and thoroughness of training provided. [652:A.9.5.1]

A.40.7.2 All plant personnel, including management; supervisors; and operating, housekeeping, and maintenance personnel should receive general awareness training for combustible dust hazards, commensurate with their job responsibilities, including training on locations where hazards can exist on site, appropriate measures to minimize hazards, and response to emergencies. [652:9.5.2]

A.40.7.2.1 Safe work habits are developed and do not occur naturally. The training program should provide enough background information regarding the hazards of the materials and the process so that the employees can understand why it is important to follow the prescribed procedures. Training should address the following:

(1) The hazards of their working environment and procedures in case of emergencies, including fires, explosions, and hazardous materials releases.
(2) Operating, inspection, testing, and maintenance procedures applicable to their assigned work
(3) Normal process procedures as well as emergency procedures and changes to procedures
(4) Emergency response plans, including safe and proper evacuation of their work area and the permissible methods for fighting incipient fires in their work area
(5) The necessity for proper functioning of related fire and explosion protection systems
(6) Safe handling, use, storage, and disposal of hazardous materials used in the employees' work areas
(7) The location and operation of fire protection equipment, manual pull stations and alarms, emergency phones, first-aid supplies, and safety equipment
(8) Equipment operation, safe startup and shutdown, and response to upset conditions
[652:9.5.2.1]

A.40.7.2.3 The extent of this training should be based on the level of interaction the person is expected to have with the system. For example, operators need to be aware of the hazards presented by explosion suppression systems but might not need to know how to operate the suppression system (e.g., interfacing with the system control panel or locking out devices).
Maintenance personnel, on the other hand, might need to know how and when to lock out the devices and how to return the system to its operational state. [652:A.9.5.2.3]

A.40.8.2 Qualified contractors should have proper credentials, which include applicable American Society of Mechanical Engineers (ASME) stamps, professional licenses, and so forth. [652:A.9.6.2]

A.40.8.3 It is suggested that annual meetings be conducted with regular contractors to review the facility's safe work practices and policies. Some points to cover include to whom the contractors would report at the facility, who at the facility can authorize hot work or fire protection impairments, and smoking and nonsmoking areas. The owner/operator does not necessarily need to provide the training to the contractor. [652:A.9.6.3]

A.40.8.3.3 In addition to the combustible dust fire and explosion hazards, contractors should also be made aware of other potential process and occupational hazards. There can be combustible materials other than combustible dusts in the equipment or immediate vicinity where contractors might be working. Combustion of dusts can generate toxic products, and some combustible dusts are acutely toxic. [652:A.9.6.3.3]

A.40.9.1 All plant personnel, including management, supervisors, and maintenance and operating personnel, should be trained to participate in plans for controlling plant emergencies.

The emergency plan should contain the following elements:

(1) A signal or alarm system
(2) Identification of means of egress
(3) Minimization of effects on operating personnel and the community
(4) Minimization of property and equipment losses
(5) Interdepartmental and interplant cooperation
(6) Cooperation of outside agencies
(7) The release of accurate information to the public

Emergency drills should be performed annually by plant personnel. Malfunctions of the process should be simulated and emergency actions undertaken. Disaster drills that simulate a major catastrophic situation should be undertaken periodically with the cooperation and participation of public fire, police, and other local community emergency units and nearby cooperating plants.

Specialized training for public fire department(s) and industrial fire brigades can be warranted due to facility specific hazards where the methods to control and extinguish a fire can be outside of their normal arena of traditional fire fighting.
[652:A.9.7.1]

A.40.10 To thoroughly assess the risks, analyze the incident, and take any corrective steps necessary, investigations should be conducted promptly based on the nature of the incident and in coordination with the AHJ (as applicable).

The investigation should include root cause analysis and should include a review of existing control measures and underlying systemic factors. Appropriate corrective action should be taken to prevent recurrence and to assess and monitor the effectiveness of actions taken.

Such investigations should be carried out by trained persons (internal or external) and include participation of workers. All investigations should conclude with a report on the action taken to prevent recurrence.

Investigation reports should be reviewed with all affected personnel and their representatives (including contract employees where applicable) whose job tasks are relevant to the incident findings, and with the health and safety committee, to make any appropriate recommendations. Any recommendations from the safety and health committee should be communicated to the appropriate persons for corrective action, included in the management review, and considered for continual improvement activities.

A system should be established to promptly address and resolve the incident report findings and recommendations.

Corrective actions resulting from investigations should be implemented in all areas where there is a risk of similar incidents and subsequently checked to avoid repetition of injuries and incidents that gave rise to the investigation.

Reports produced by external investigation agencies should be acted upon in the same manner as internal investigations.

Incident investigation reports should be made available to affected employees and their representatives at no cost.
[652:A.9.8]

A.40.10.1 Events where there are injuries, equipment damage, or significant business interruption are subject to investigation.

In addition to investigation of fires and explosions, it is also a good practice to investigate near misses (events that could have resulted in fires or explosions under different circumstances) and all activations of active fire and explosion mitigation systems. It is important to educate facility personnel on the concept of what a near miss is and to clearly communicate their responsibility for reporting both incidents and near misses.

Near-miss events often indicate an underlying problem that should be corrected. See NFPA 654 for additional information. Barriers to reporting should be removed, as described in ANSI/AIHA Z10, Occupational Health and Safety Management Systems. Investigations should include workers and their representatives, as appropriate.
[652:A.9.8.1]

A.40.10.4 The term affected personnel is intended to include members of employee organizations such as safety committees and employee representatives of various types. [652:A.9.8.4]

A.40.11.1 It is essential to have thorough written documentation, as the slightest changes to procedures,

processes, resources, staffing, and equipment, including equipment from suppliers, can have a dramatic impact on the overall hazard analysis. Change includes something as benign as process materials sourcing from a different manufacturer, the same raw material manufacturer using new methods to produce the product, or changes in formulation. These changes from a supplier's end can impact the characteristics of the processes and materials. Individuals involved should include those involved in the process such as maintenance, engineering, and purchasing personnel, and all others as deemed necessary. Staffing and job tasks are not intended for shift changes, but for overall staff and their representative tasks. For reference, see the documentation form in ANSI/AIHA Z10, Occupational Health and Safety Management Systems.

The following changes in material or process should warrant a management of change review per Section 9.9, and new samples should be collected and analyzed:

(1) New process equipment is installed that presents new hazards.
(2) New operating conditions for existing equipment create a new hazard.
(3) A new material is used in the process.
[652:A.9.9.1]

A.40.11.2(1) The proposed change and why it is needed should be described. It should include sufficient technical information to facilitate review by the approvers, address adverse effects that could occur, and describe how such effects would be mitigated by the proposed change. [652:A.9.2.(1)]

A.40.11.2(2) Some fire and explosion protection systems introduce additional hazards into the process environment. These hazards can include, but are not limited to, energy in suppression canisters, asphyxiation hazards from inert gases, and mechanical laceration/amputation hazards from explosion isolation systems. While these are not fire or explosion hazards, they should be addressed as part of the management of change review per this document so that appropriate controls can be applied. [652:A.9.9.2(2)]

A.40.11.3 While implementation of the management of change procedure is not required for replacement in kind, it is critical that only qualified personnel are the ones who determine if the replacement is "in kind." These qualified personnel should be intimately familiar with the items listed in 9.9.2, as well as the broad scope of hazards associated with the particular process.

Replacement "in kind" for raw materials. Care must be taken when substituting raw materials. There have been cases where a seemingly equivalent material substitution resulted in a large change in the process hazard. Not all safety properties of a material are characterized in, for example, an MSDS. Chemical composition might be identical, but quite different static ignition hazards due to bulk resistivity and charge relaxation rate can appreciably increase the hazard. Flowability differences can affect the hazard probability too. Differences in natural raw materials are generally less of a concern than manufactured materials in this regard.
[652:A.9.9.3]

A.40.12 The creation and retention of documentation is necessary in order to implement and periodically evaluate the effectiveness of the management systems presented in this standard. Documentation in any form (e.g., electronic) should remain legible and be readily identifiable and accessible. The documentation should be protected against damage, deterioration, or loss, and retained for the applicable period specified in this standard. [652:A.9.10]

A.40.12.1(3) Incident investigation reports should be maintained for review during cyclical hazards evaluation reviews at least until the changes are incorporated in the dust hazard analysis and for compliance with other regulatory requirements. [652:A.9.10.1(3)]

A.40.12.1(5) Process and technology information includes process performance parameters, properties of the materials being handled, and documents such as design drawings, design codes and standards used as the basis for both the process and the equipment, equipment manufacturers' operating and maintenance manuals, standard operating procedures, and safety systems operation. [652:A.9.10.1(5)]

A.40.12.1(6) Management of change documents should be retained until the changes are incorporated into the next dust hazards analysis. [652: A.9.10.1(6)]

A.40.12.1(8) Contractor records typically include information such as the contract documentation with scope of work and necessary insurance coverage, the contractor's safety programs, records demonstrating the contractor's safety performance, qualifications and certifications necessary for the work to be done, periodic evaluations of the contractor's work performance, and records demonstrating that the employees of the contractor have been trained to safely perform the assigned work. [652:A.9.10.1(8)]

A.40.14 Effective employee participation is an essential element of the Occupational Health and Safety Management System (OHSMS) to achieve continuous improvement in risk reduction, as described in ANSI/AIHA Z10-2012, Occupational Health and Safety Management Systems. The OHSMS ensures that employees and their authorized representatives are involved, informed, and trained on all aspects of health associated with their work, including emergency arrangements. Employee participation includes items such as, but not limited to, the following:

(1) Involving employees and their authorized representatives, where they exist, in establishing, maintaining, and evaluating the OSHMS
(2) An occupational health and safety committee
(3) Access to safety and health information
(4) Risk assessment, implementation, and review of risk control measures
(5) Incident and near-miss investigations
(6) Inspections and audits
(7) Reporting unsafe conditions, tools, equipment, and practices
(8) Mentoring of new employees, apprentices, and for onsite orientation
(9) Identifying hazards with strong emphasis on high-risk jobs and the application of the hierarchy of controls
(10) In accordance with established and maintained procedures, appropriate arrangements to ensure that concerns, ideas, and input that employees and their representatives share are received, considered, and responded to
(11) Employees removing themselves from work situations that they have reasonable justification to believe present an imminent and serious danger to their safety or health

Employees who justifiably take those actions by notifying their supervisor should be protected from discrimination by removing those barriers as outlined in the OSHMS.

Where this standard and annex refer to employees and their representatives (where representatives exist), the intention is that they should be consulted as the primary means to achieve appropriate participation in the development and implementation of all aspects of the OHSMS. In some instances, it might be appropriate to involve all employees and all representatives.

Employee participation is a key component of an OHSMS. When employees and their representatives are engaged and their contributions are taken seriously, they tend to be more satisfied and committed to the OHSMS, and the system is more effective. Engaging employees and their representatives in dialogue with management and each other about safety and health can lead to improved relationships, better overall communication, improved compliance, and reduced rates of injury, illness, and death. The improved morale translates to greater safety and health results.

Employees and their representatives need to be trained about how the OHSMS works and to evaluate it periodically to determine whether improvements need to be made. The information needs to be presented in a form and language that employees and their representatives easily understand.
(See also A.40.10.4.)
[652: A.9.12]

Statement of Problem and Substantiation for Public Comment

This is a companion proposal deleting the majority of the current language in Chapter 40 including the related appendix notes and replacing it with new NFPA 652 language including related appendix notes.

Related Item

Public Input No. 243-NFPA 1-2015 [New Section after 40.1]

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Public Comment No. 19-NFPA 1-2016 [New Section after A.50.6.1.2.2]

A.50.7.1.9.1 An approved method of leak detection would include pressurizing the LP gas system with LP gas and utilizing a gas meter to detect the presence of LP gas around the tank, piping and appliances.

Statement of Problem and Substantiation for Public Comment

Sections 50.7.2.3 and 50.7.1.9.1 state that leak detection shall occur prior to each use. However, neither section defines an acceptable process for "leak detection." The code needs to provide some guidance to the AHJ and the end user as to what is expected by both parties in order to achieve compliance with "leak detection." The proposed annex text is just one suggestion. Other options could potentially work and the language could also be inserted in the core text. Regardless of the details of the process for acceptable "leak detection," the process does need to be specified in the code or the annex as it is a fundamental issue to ensure safety of these LP Gas systems.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 30-NFPA 1-2016 [Section No. 50.7.2.3]	

Related Item

Public Input No. 168-NFPA 1-2015 [New Section after 50.6.3]

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Public Comment No. 40-NFPA 1-2016 [Chapter F]

Annex F Informational References

F.1 Referenced Publications.

The documents or portions thereof listed in this annex are referenced within the informational sections of this code and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

F.1.1 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 2, *Hydrogen Technologies Code*, 2016 edition.

NFPA 3, *Recommended Practice for Commissioning of Fire Protection and Life Safety Systems*, 2015 edition.

NFPA 10, *Standard for Portable Fire Extinguishers*, 2017 edition.

NFPA 11, *Standard for Low-, Medium-, and High-Expansion Foam*, 2016 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2016 edition.

NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, 2016 edition.

NFPA 13E, *Recommended Practice for Fire Department Operations in Properties Protected by Sprinkler and Standpipe Systems*, 2015 edition.

NFPA 13R, *Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height*, 2016 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*, 2016 edition.

NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*, 2017 edition.

NFPA 16, *Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems*, 2015 edition.

NFPA 17, *Standard for Dry Chemical Extinguishing Systems*, 2017 edition.

NFPA 17A, *Standard for Wet Chemical Extinguishing Systems*, 2017 edition.

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*, 2016 edition.

NFPA 22, *Standard for Water Tanks for Private Fire Protection*, 2013 edition.

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, 2016 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, 2017 edition.

NFPA 30, *Flammable and Combustible Liquids Code*, 2018 edition.

NFPA 30A, *Code for Motor Fuel Dispensing Facilities and Repair Garages*, 2018 edition.

NFPA 30B, *Code for the Manufacture and Storage of Aerosol Products*, 2015 edition.

NFPA 31, *Standard for the Installation of Oil-Burning Equipment*, 2016 edition.

NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials*, 2016 edition.

NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals*, 2015 edition.

NFPA 51, *Standard for the Design and Installation of Oxygen–Fuel Gas Systems for Welding, Cutting, and Allied Processes*, 2018 edition.

NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*, 2014 edition.

NFPA 52, *Vehicular Gaseous Fuel Systems Code*, 2016 edition.

NFPA 54, *National Fuel Gas Code* , 2018 edition.

NFPA 55, *Compressed Gases and Cryogenic Fluids Code*, 2016 edition.

NFPA 58, *Liquefied Petroleum Gas Code*, 2017 edition.

NFPA 59A, *Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)*, 2016 edition.

NFPA 61, *Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities* , 2017 edition.

NFPA 68, *Standard on Explosion Protection by Deflagration Venting*, 2013 edition.

NFPA 69, *Standard on Explosion Prevention Systems*, 2014 edition.

NFPA 70 ®, *National Electrical Code* ®, 2017 edition.

NFPA 72 ®, *National Fire Alarm and Signaling Code*, 2016 edition.

NFPA 77, *Recommended Practice on Static Electricity*, 2014 edition.

NFPA 80, *Standard for Fire Doors and Other Opening Protectives*, 2016 edition.

NFPA 80A, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures*, 2017 edition.

NFPA 82, *Standard on Incinerators and Waste and Linen Handling Systems and Equipment*, 2014 edition.

NFPA 86, *Standard for Ovens and Furnaces*, 2015 edition.

NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, 2018 edition.

NFPA 90B, *Standard for the Installation of Warm Air Heating and Air-Conditioning Systems*, 2018 edition.

NFPA 91, *Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Particulate Solids*, 2015 edition.

NFPA 92, *Standard for Smoke Control Systems* , 2015 edition.

NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*, 2017 edition.

NFPA 99, *Health Care Facilities Code*, 2018 edition.

NFPA *101* ®, *Life Safety Code* ®, 2018 edition.

NFPA 101A, *Guide on Alternative Approaches to Life Safety*, 2016 edition.

NFPA 102, *Standard for Grandstands, Folding and Telescopic Seating, Tents, and Membrane Structures*, 2016 edition.

NFPA 105, *Standard for Smoke Door Assemblies and Other Opening Protectives*, 2016 edition.

NFPA 110, *Standard for Emergency and Standby Power Systems*, 2016 edition.

NFPA 170, *Standard for Fire Safety and Emergency Symbols*, 2015 edition.

NFPA 204, *Standard for Smoke and Heat Venting*, 2015 edition.

NFPA 220, *Standard on Types of Building Construction*, 2018 edition.

NFPA 232, *Standard for the Protection of Records*, 2017 edition.

NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations*, 2013 edition.

NFPA 252, *Standard Methods of Fire Tests of Door Assemblies*, 2017 edition.

NFPA 257, *Standard on Fire Test for Window and Glass Block Assemblies*, 2017 edition.

NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, 2013 edition.

NFPA 260, *Standard Methods of Tests and Classification System for Cigarette Ignition Resistance of Components of Upholstered Furniture*, 2013 edition.

NFPA 261, *Standard Method of Test for Determining Resistance of Mock-Up Upholstered Furniture Material Assemblies to Ignition by Smoldering Cigarettes*, 2013 edition.

NFPA 265, *Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls*, 2015 edition.

NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*, 2015 edition.

NFPA 288, *Standard Methods of Fire Tests of Floor Fire Door Assemblies Installed Horizontally in Fire Resistance–Rated Floor Systems*, 2017 edition.

NFPA 289, *Standard Method of Fire Test for Individual Fuel Packages*, 2013 edition.

NFPA 291, *Recommended Practice for Fire Flow Testing and Marking of Hydrants*, 2016 edition.

NFPA 302, *Fire Protection Standard for Pleasure and Commercial Motor Craft*, 2015 edition.

NFPA 303, *Fire Protection Standard for Marinas and Boatyards*, 2011 edition.

NFPA 326, *Standard for the Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair*, 2015 edition.

NFPA 329, *Recommended Practice for Handling Releases of Flammable and Combustible Liquids and Gases*, 2015 edition.

NFPA 385, *Standard for Tank Vehicles for Flammable and Combustible Liquids*, 2017 edition.

NFPA 400, *Hazardous Materials Code*, 2016 edition.

NFPA 402, *Guide for Aircraft Rescue and Fire-Fighting Operations* , 2013 edition.

NFPA 409, *Standard on Aircraft Hangars*, 2016 edition.

NFPA 415, *Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways*, 2016 edition.

NFPA 418, *Standard for Heliports*, 2016 edition.

NFPA 484, *Standard for Combustible Metals*, 2018 edition.

NFPA 495, *Explosive Materials Code*, 2013 edition.

NFPA 496, *Standard for Purged and Pressurized Enclosures for Electrical Equipment*, 2017 edition.

NFPA 497, *Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas*, 2017 edition.

NFPA 499, *Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas*, 2017 edition.

NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations*, 2013 edition.

NFPA 600, *Standard on Facility Fire Brigades*, 2015 edition.

NFPA 601, *Standard for Security Services in Fire Loss Prevention*, 2015 edition.

NFPA 610, *Guide for Emergency and Safety Operations at Motorsports Venues*, 2014.

NFPA 654, *Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids*, 2017 edition.

NFPA 655, *Standard for Prevention of Sulfur Fires and Explosions*, 2017 edition.

NFPA 701, *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*, 2015 edition.

NFPA 703, *Standard for Fire Retardant–Treated Wood and Fire-Retardant Coatings for Building Materials*, 2018 edition.

NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response*, 2017 edition.

NFPA 720, *Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment*, 2015 edition.

NFPA 801, *Standard for Fire Protection for Facilities Handling Radioactive Materials*, 2014 edition.

NFPA 850, *Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations*, 2015 edition.

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NFPA 1035, *Standard on Fire and Life Safety Educator, Public Information Officer, Youth Firesetter Intervention Specialist, and Youth Firesetter Program Manager Professional Qualifications*, 2016 edition.

NFPA 1037, *Standard on Fire Marshal Professional Qualifications*, 2016 edition.

NFPA 1122, *Code for Model Rocketry*, 2018 edition.

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NFPA 1141, *Standard for Fire Protection Infrastructure for Land Development in Wildland, Rural, and Suburban Areas*, 2017 edition.

NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting*, 2017 edition.

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NFPA 1221, *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems*, 2016 edition.

NFPA 1600 ®, *Standard on Disaster/Emergency Management and Business Continuity Programs*, 2016 edition.

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F.1.2.2 ANSI Publications.

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ANSI Z83.11, Gas Food Service Equipment, 2006 (reaffirmed ~~2011~~ ***2012*** *).*

F.1.2.3 API Publications.

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"An Engineering Analysis of the Effects of Oxygenated Fuels on Marketing Vapor Recovery Equipment," September 1990.

API 12R1 **RP** 12R1 , Setting, Maintenance, Inspection, Operation, and Repair of Tanks in Production Service, 2008.

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F.2 _ References for Extracts.

The following documents are listed here to provide reference information, including title and edition, for extracts given throughout the nonmandatory sections of this code as indicated by a reference in brackets [ ] following a section or paragraph. These documents are not a part of the requirements of this document unless also listed in Chapter 2 for other reasons.

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Statement of Problem and Substantiation for Public Comment

Major revisions from FR 60, FR 62, FR63, and FR68.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 39-NFPA 1-2016 [Chapter 2]	Major revisions from FR41, FR 43, FR 44, FR 46, FR 56, and FR 120.

Related Item

First Revision No. 60-NFPA 1-2015 [Section No. F.1.2.2]

First Revision No. 62-NFPA 1-2015 [Section No. F.1.2.4]

First Revision No. 63-NFPA 1-2015 [Section No. F.1.2.5]

First Revision No. 68-NFPA 1-2015 [Section No. F.1.2.11]

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Public Comment No. 52-NFPA 1-2016 [Section No. F.1.2.6]

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Statement of Problem and Substantiation for Public Comment

date updates - This is an important update and has not been completed at the first draft stage.

Related Item

Public Input No. 190-NFPA 1-2015 [Section No. F.1.2.6]

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Committee Input No. 39-NFPA 1-2015 [Global Input]

Extracts from the following standards to be updated at the second draft stage:

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NFPA 14, Standard for the Installation of Standpipe and Hose Systems, 2016 edition.

NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems, 2017 edition.

NFPA 30, Flammable and Combustible Liquids Code, 2018 edition.

NFPA 30A, Code for Motor Fuel Dispensing Facilities and Repair Garages, 2018 edition.

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NFPA 52, Vehicular Fuel Systems Code, 2016 edition.

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NFPA 61, Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities, 2017 edition.

NFPA 70®, National Electrical Code®, 2017 edition.

NFPA 70B, Recommended Practice for Electrical Equipment Maintenance, 2016 edition.

NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems, 2018 edition.

NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations, 2017 edition.

NFPA 101®, Life Safety Code®, 2018 edition.

NFPA 211, Standard for Chimneys, Fireplaces, Vents, and Solid Fuel–Burning Appliances, 2016 edition.

NFPA 220, Standard on Types of Building Construction, 2018 edition.

NFPA 318, Standard for the Protection of Semiconductor Fabrication Facilities, 2018 edition.

NFPA 402, Guide for Aircraft Rescue and Fire-Fighting Operations, 2018 edition.

NFPA 407, Standard for Aircraft Fuel Servicing, 2017 edition.

NFPA 418, Standard for Heliports, 2016 edition.

NFPA 472, Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents, 2018 edition.

NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids, 2017 edition.

NFPA 1141, Standard for Fire Protection Infrastructure for Land Development in Suburban and Rural Areas, 2017 edition.

NFPA 1144, Standard for Reducing Structure Ignition Hazards from Wildland Fire, 2018 edition.

NFPA 5000®, Building Construction and Safety Code®, 2018 edition.

Submitter Information Verification

Submitter Full Name: Gregory Harrington

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Submittal Date: Wed Sep 23 13:06:01 EDT 2015

Committee Statement

Committee Statement: Extract updates.
Response Message:

Ballot Results

This item has not been balloted

Committee Input No. 42-NFPA 1-2015 [Section No. 2.3.3]

2.3.3 API Publications.

American Petroleum Institute, 1220 L Street, NW, Washington, DC 20005-4070.

API-ASME Code for Unfired Pressure Vessels for Petroleum Liquids and Gases, Pre-July 1, 1961.

API Specification 12B, *Bolted Tanks for Storage of Production Liquids*, 15th edition, 2008.

API Specification 12D, *Field Welded Tanks for Storage of Production Liquids*, 11th edition, 2008.

API Specification 12F, *Shop Welded Tanks for Storage of Production Liquids* 12th edition, 2008.

API 620, *Recommended Rules for the Design and Construction of Large, Welded, Low-Pressure Storage Tanks,* 11th edition, Addendum 2, 2010.

API Standard 650, *Welded Steel Tanks for Oil Storage,* 11th edition, Addendum 2, 2009.

API Standard 653, *Tank Inspection, Repair, Alteration, and Reconstruction,* 4th edition, 2012.

API Standard 2000, *Venting Atmospheric and Low-Pressure Storage Tanks* 5th edition, 1998.

API 2350, *Overfill Protection for Storage Tanks in Petroleum Facilities,* 4th edition, 2012.

API BULL 1529, *Aviation Fueling Hose*, 1998.

API 607, *Fire Test for Soft-Seated Quarter-Turn Valves*, 1993.

Submitter Information Verification

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Submittal Date: Thu Sep 24 09:15:58 EDT 2015

Committee Statement

Committee Statement: API publications to be updated at second draft stage.
Response Message:

Ballot Results

This item has not been balloted

Committee Input No. 45-NFPA 1-2015 [Section No. 2.3.6]

2.3.6 ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM A 395, *Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures*, 1999 (reaffirmed 2009).

ASTM D 5/D 5M, *Standard Test Method for Penetration of Bituminous Materials*, 2013.

ASTM D 56, *Standard Test Method for Flash Point by Tag Closed Cup Tester*, 2005(reaffirmed 2010).

ASTM D 92, *Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester*, 2012b.

ASTM D 93, *Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester*, 2012.

ASTM D 323, *Standard Method of Test for Vapor Pressure of Petroleum Products (Reid Method),* 2008.

ASTM D 396, *Standard Specification for Fuel Oils*, 2010.

ASTM D 635, *Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position*, 2010.

ASTM D 1929, *Standard Test Method for Determining Ignition Temperature of Plastics*, 2012.

ASTM D 2843, *Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics*, 2010.

ASTM D 2859, *Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials*, 2006 (2011).

ASTM D 2898, *Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing*, 2010.

ASTM D 3278, *Standard Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus*, 1996 (reaffirmed 2011).

ASTM D 3699, *Standard Specification for Kerosene*, 2008.

ASTM D 3828, *Standard Test Methods for Flash Point by Small Scale Closed Cup Tester*, 2012a.

ASTM D 4359, *Standard Test for Determining Whether a Material is a Liquid or a Solid*, 1990 (reaffirmed 2012).

ASTM D 5391, *Standard Test for Electrical Conductivity and Resistivity of a Flowing High Purity Water Sample*, 1999 (2009).

ASTM D 6448, *Industrial Burner Fuels from Used Lube Oils*, 2009.

ASTM D 6751, *Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuel*, 2010.

ASTM D 6823, *Commercial Burner Fuels from Used Lube Oils*, 2008.

ASTM E 84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, 2013.

ASTM E 108, *Standard Test Methods for Fire Tests of Roof Coverings*, 2011.

ASTM E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, 2012a.

ASTM E 136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C*, 2012.

ASTM E 648, *Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source*, 2010 e1.

ASTM E 681, *Standard Test Method for Concentration Limits of Flammability of Chemicals (Vapors and Gases)*, 2009.

ASTM E 814, *Standard Test Method for Fire Tests of Through-Penetration Fire Stops*, 2011a.

ASTM E 1354, *Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter*, 2013.

ASTM E 1537, *Standard Test Method for Fire Testing of Upholstered Furniture*, 2012.

ASTM E 1590, *Standard Test Method for Fire Testing of Mattresses*, 2012.

ASTM E 1591, *Standard Guide for Obtaining Data for Deterministic Fire Models*, 2007.

ASTM E 1966, *Standard Test Method for Fire-Resistive Joint Systems*, 2007 (2011).

ASTM E 2074, *Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies*, 2000e1 (withdrawn 2007).

ASTM E 2174, *Standard Practice for On-Site Inspection of Installed Fire Stops*, 2010a e1.

ASTM E 2307, *Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus*, 2010.

ASTM E 2393, *Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers*, 2010a.

ASTM E 2404, *Standard Practice for Specimen Preparation and Mounting of Textile, Paper or Polymeric (Including Vinyl) Wall or Ceiling Coverings, and of Facings and Wood Veneers Intended to be Applied on Site Over a Wood Substrate, to Assess Surface Burning Characteristics*, 2012.

ASTM E 2573, *Standard Practice for Specimen Preparation and Mounting of Site-Fabricated Stretch Systems to Assess Surface Burning Characteristics,* 2012.

ASTM E 2599, *Standard Practice for Specimen Preparation and Mounting of Reflective Insulation, Radiant Barrier, and Vinyl Stretch Ceiling Materials for Building Applications to Assess Surface Burning Characteristics*, 2011.

ASTM E 2652, *Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-Shaped Airflow Stabilizer, at 750 Degrees C*, 2012.

ASTM F 852, *Standard for Portable Gasoline Containers for Consumer Use*, 2008.

ASTM F 976, *Standard for Portable Kerosene Containers for Consumer Use*, 2008.

Submitter Information Verification

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Submittal Date: Thu Sep 24 09:32:10 EDT 2015

Committee Statement

Committee Statement: ASTM references to be updated at second draft stage.
Response Message:

Ballot Results

This item has not been balloted

Committee Input No. 47-NFPA 1-2015 [Section No. 2.3.9]

2.3.9 FM Publications.

FM Global, 1301 Atwood Avenue, P.O. Box 7500, Johnston, RI 02919.

Approval Standard for Safety Containers and Filling, Supply, and Disposal Containers — Class Number 6051 and 6052, May 1976.

ANSI/FM 4880,*American National Standard for Evaluating Insulated Wall or Wall and Roof/Ceiling Assemblies, Plastic Interior Finish Materials, Plastic Exterior Building Panels, Wall/Ceiling Coating Systems, Interior or Exterior Finish Systems*, 2007.

Approval Standard for Plastic Plugs for Steel Drums, Class Number 6083, October 2006.

Approval Standard 6921, Containers for Combustible Waste, 2004.

Submitter Information Verification

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Submittal Date: Thu Sep 24 09:45:58 EDT 2015

Committee Statement

Committee Statement: FM publications to be updated at second draft stage (NFPA 30 and NFPA 101 extracts).
Response Message:

Ballot Results

This item has not been balloted

Committee Input No. 146-NFPA 1-2015 [Section No. 2.3.11]

2.3.11 IIAR Publications.

International Institute of Ammonia Refrigeration, 1001 N. Fairfax Street, Suite 503, Alexandria, VA 22314.

ANSI/IIAR 2, *Equipment, Design, and Installation of Closed-Circuit Ammonia Mechanical Refrigerating Systems*, 2008.

ANSI/IIAR 6, Maintenance and Inspection of Closed-Circuit Ammonia Mechanical Refrigerating Systems, 2016.

ANSI/IIAR 7, *Developing Operating Procedures for Closed-Circuit Ammonia Mechanical Refrigerating Systems*, 2013.

Submitter Information Verification

Submitter Full Name: Kristin Bigda
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Submittal Date: Mon Oct 19 19:56:20 EDT 2015

Committee Statement

Committee Statement: Referenced publication update. ANSI/IIAR 6 is anticipated to be complete prior to conclusion of the current NFPA 1 cycle.
Response Message:

Ballot Results

This item has not been balloted

Committee Input No. 50-NFPA 1-2015 [Section No. 2.3.14]

2.3.14 NRFC Publications.

National Railroad Freight Committee, 222 South Riverside Plaza, Chicago, IL 60606-5945.

Uniform Freight Classification (UFC), 2005.

Submitter Information Verification

Submitter Full Name: Gregory Harrington
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Submittal Date: Thu Sep 24 09:54:10 EDT 2015

Committee Statement

Committee Statement: NRFC publication to be updated at second draft stage (NFPA 30 extract).
Response Message:

Ballot Results

This item has not been balloted

Committee Input No. 53-NFPA 1-2015 [Section No. 2.3.16]

2.3.16 STI Publications.

Steel Tank Institute, 570 Oakwood Road, Lake Zurich, IL 60047.

STI SP001, *Standard for the Inspection of Aboveground Storage Tanks*, 5th edition, 2011.

Submitter Information Verification

Submitter Full Name: Gregory Harrington
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Submittal Date: Thu Sep 24 10:03:04 EDT 2015

Committee Statement

Committee Statement: STI publication to be updated at second draft stage (NFPA 30 extract).
Response Message:

Ballot Results

This item has not been balloted

Committee Input No. 54-NFPA 1-2015 [Section No. 2.3.17]

2.3.17 UL Publications.

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

ANSI/UL 8, *Standard for Water Based Agent Fire Extinguishers*, 2005, Revised 2009.

ANSI/UL 9, *Standard for Fire Tests of Window Assemblies*, 2009.

ANSI/UL 10B, *Standard for Fire Tests of Door Assemblies*, 2008, Revised 2009.

ANSI/UL 10C, *Standard for Positive Pressure Fire Tests of Door Assemblies*, 2009.

ANSI/UL 30, *Standard for Metal Safety Cans*, 1995, Revised 2009.

UL 58, *Standard for Steel Underground Tanks for Flammable and Combustible Liquids*, 1996, Revised 1998.

ANSI/UL 80, *Standard for Steel Tanks for Oil Burner Fuels and Other Combustible Liquids*, 2007, Revised 2009.

ANSI/UL 142, *Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids*, 2006, Revised 2010.

ANSI/UL 147A, *Standard for Nonrefillable (Disposable) Type Fuel Gas Cylinder Assemblies*, 2005, Revised 2009.

ANSI/UL 147B, *Standard for Nonrefillable (Disposable) Type Metal Container Assemblies for Butane*, 2005, Revised 2008.

ANSI/UL 154, *Standard for Carbon Dioxide Fire Extinguishers*, 2005, Revised 2009.

UL 162, *Standard for Safety for Foam Equipment and Liquid Concentrates*, 1994.

ANSI/UL 197, *Standard for Commercial Electric Cooking Appliances*, 2010, Revised 2011.

ANSI/UL 263, *Standard for Fire Tests of Building Construction and Materials*, 2011.

ANSI/UL 294, *Standard for Access Control System Units*, 1999, Revised 2010.

ANSI/UL 296A, *Standard for Waste Oil-Burning Air-Heating Appliances*, 2010.

ANSI/UL 299, *Standard for Dry Chemical Fire Extinguishers*, 2012.

ANSI/UL 300, *Standard for Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas*, 2005, Revised 2010.

ANSI/UL 340, *Test for Comparative Flammability of Liquids*, 2009.

ANSI/UL 499, *Standard for Electric Heating Appliances*, 2005.

ANSI/UL 555, *Standard for Fire Dampers*, 2006, Revised 2012.

ANSI/UL 555S, *Standard for Smoke Dampers*, 1999, Revised 2012.

ANSI/UL 567, *Standard for Emergency Breakaway Fittings, Swivel Connectors and Pipe Connection Fittings for Petroleum Products and LP-Gas*, 2003, Revised 2011.

ANSI/UL 626, *Standard for Water Fire Extinguishers*, 2005, Revised 2012.

ANSI/UL 710B, *Standard for Recirculating Exhaust Systems*, 2004, Revised 2009.

ANSI/UL 711, *Standard for Rating and Fire Testing of Fire Extinguishers*, 2004, Revised 2009.

ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, 2008, Revised 2010.

ANSI/UL 790, *Standard for Safety for Tests for Fire Resistance of Roof Covering Materials*, 2004, Revised 2008.

ANSI/UL 842, *Standard for Valves for Flammable Fluids*, 2007, Revised 2011.

ANSI/UL 900, *Standard for Air Filter Units*, 2004, Revised 2009.

ANSI/UL 913, *Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III Division 1, Hazardous (Classified) Locations,* 2006, Revised 2010.

ANSI/UL 924, *Standard for Emergency Lighting and Power Equipment*, 2006, Revised 2011.

UL 971, *Standard for Nonmetallic Underground Piping for Flammable Liquids*, 1995, Revised 2006.

ANSI/UL 1037, *Standard for Antitheft Alarms and Devices*, 1999, Revised 2009.

ANSI/UL 1040, *Standard for Fire Test of Insulated Wall Construction*, 1996, Revised 2007.

ANSI/UL 1313, *Standard for Nonmetallic Safety Cans for Petroleum Products,* 1993, Revised 2007.

UL 1316, *Standard for Glass-Fiber Reinforced Plastic Underground Storage Tanks for Petroleum Products, Alcohols, and Alcohol-Gasoline Mixtures*, 2006.

UL 1479, *Standard for Fire Tests of Through-Penetration Firestops*, 2003, Revised 2010.

UL 1573, *Standard for Stage and Studio Luminaires and Connector Strips*, 2003.

UL 1640, *Standard for Portable Power-Distribution Equipment*, 2007.

ANSI/UL 1715, *Standard for Fire Test of Interior Finish Material*, 1997, Revised 2008.

ANSI/UL 1746, *Standard for External Corrosion Protection Systems for Steel Underground Storage Tanks*, 2007.

UL 1803, *Standard for Factory Follow-up on Third Party Certified Portable Fire Extinguishers,* 2012.

UL 1975, *Standard for Fire Tests for Foamed Plastics Used for Decorative Purposes*, 2006.

ANSI/UL 1994, *Standard for Luminous Egress Path Marking Systems*, 2004, Revised 2010.

UL 2079, *Standard for Tests for Fire Resistance of Building Joint Systems*, 2004, Revised 2008.

UL 2080, *Standard for Fire Resistant Tanks for Flammable and Combustible Liquids,* 2000.

ANSI/UL 2085, *Standard for Protected Aboveground Tanks for Flammable and Combustible Liquids*, 1997, Revised 2010.

ANSI/UL 2129, *Standard for Halocarbon Clean Agent Fire Extinguishers*, 2005, Revised 2012.

ANSI/UL 2208, *Standard for Solvent Distillation Units*, 2005, Revised 2011.

UL 2245, *Standard for Below-Grade Vaults for Flammable Liquid Storage Tanks,* 2006.

UL 2368, *Standard for Fire Exposure Testing of Intermediate Bulk Containers for Flammable and Combustible Liquids*, 2012.

ANSI/UL 2586, *Standard for Hose Nozzle Valves,* 2011, Revised 2012.

Submitter Information Verification

Submitter Full Name: Gregory Harrington
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Submittal Date: Thu Sep 24 10:06:21 EDT 2015

Committee Statement

Committee Statement: UL publications to be updated at second draft stage (numerous extracts).
Response Message:

Public Input No. 248-NFPA 1-2015 [Section No. 2.3.17]

Ballot Results

This item has not been balloted

Committee Input No. 55-NFPA 1-2015 [Section No. 2.3.18]

2.3.18 ULC Publications.

Underwriters' Laboratories of Canada, 7 Underwriters Road, Toronto, Ontario M1R 3B4, Canada.

CAN/ULC-S503, *Standard for Carbon-Dioxide Fire Extinguishers*, 2005, Revised 2010.

CAN/ULC-S504, *Standard for Dry Chemical Fire Extinguishers*, 2002, Revised 2009.

CAN/ULC-S507, *Standard for Water Fire Extinguishers*, 2005, Revised 2010.

CAN/ULC-S508, *Standard for Rating and Testing of Fire Extinguishers and Fire Extinguishing Agents*, 2004, Revised 2009.

CAN/ULC-S512, *Standard for Halogenated Agent Hand and Wheeled Fire Extinguishers*, 2007.

CAN/ULC-S554, *Standard for Water Based Agent Fire Extinguishers*, 2005, Reaffirmed 2010.

CAN/ULC-S566, *Standard for Halocarbon Clean Agent Fire Extinguishers*, 2005, Revised 2007.

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Submitter Full Name: Gregory Harrington
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Submittal Date: Thu Sep 24 10:09:49 EDT 2015

Committee Statement

Committee Statement: ULC publications to be updated at second draft stage (NFPA 10 extracts).
Response Message:

Public Input No. 218-NFPA 1-2015 [Section No. 2.3.18]

Ballot Results

This item has not been balloted

Committee Input No. 155-NFPA 1-2015 [Chapter 31 [Title Only]]

Forest Products and Biomass Feedstocks

Submitter Information Verification

Submitter Full Name: Gregory Harrington
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Submittal Date: Tue Oct 20 14:06:50 EDT 2015

Committee Statement

Committee Statement: The modification of the Chapter name is to provide for material covered by a new section to be added to the chapter dealing with biomass feedstock utilized at biomass to ethanol industrial facilities.

The revision is being moved as a committee input to solicit public comments and to allow further review at the second draft stage.

Response Message:

Public Input No. 238-NFPA 1-2015 [Chapter 31 [Title Only]]

Ballot Results

This item has not been balloted

Committee Input No. 156-NFPA 1-2015 [Section No. 31.1]

31.1 * General.

The storage, manufacturing, and processing of timber, lumber, plywood, veneers, biomass feedstock and by-products shall be in accordance with this chapter and NFPA 664, *Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities*.

Submitter Information Verification

Submitter Full Name: Gregory Harrington
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Street Address:
City:
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Submittal Date: Tue Oct 20 14:08:23 EDT 2015

Committee Statement

Committee Statement: This submittal is part of a group of submittals to provide for requirements addressing the exterior storage of biomass feedstock utilized for biomass to ethanol manufacturing facilities.

The revision is being moved as a committee input to solicit public comments and to allow further review at the second draft stage.

Response Message:

Public Input No. 240-NFPA 1-2015 [Section No. 31.1]

Ballot Results

This item has not been balloted

Committee Input No. 158-NFPA 1-2015 [New Section after 31.3]

31.3.10 Outside Storage of Biomass Feedstock

31.3.10.1 The fire hazard potential inherent in biomass feedstock storage operations with large quantities of combustible materials shall be controlled by a positive fire prevention program under the direct supervision of upper level management that

shall include the following:

(1) Selection, design, and arrangement of storage yard areas and materials-handling equipment based upon proven fire prevention and protection principles

(2) Means for early fire detection, transmission of alarm, and fire extinguishment

(3) Establishment of control over the various factors that lead to spontaneous heating, including provisions for monitoring the internal condition of the pile

(4) Fire department access roads to separate large stacks and provide access for effective fire-fighting operations

(5) Separation of yard storage from yard buildings and other exposing properties

(6) Effective fire prevention maintenance program, including regular yard inspections by trained personnel

31.3.10.2 Bale stacks shall not exceed 25 feet (7620 mm) in height, 50 feet (15 240 mm) in width and 150 feet (45 720 mm) in length.

31.3.10.2.1 Bale stacks shall be in a maximum grouping of two bale stacks separated by 160 feet (48 770 mm) from each other with each group of two bale stacks separated from the next group of bale stacks by 400 feet (121 900 mm).

31.3.10.3 The storage site shall be reasonably level, on solid ground .

31.3.10.4 Access to the plant and yard from public highways shall be provided by all-weather roadways capable of supporting fire department apparatus.

31.3.10.5 All sides of each storage site shall be accessible by means of fire department access roads.

31.3.10.6 A fire department access road width of 1 1 / 2 times the bale stack height but not less than 20 ft (6 m) shall be provided, with fire department access roads between each set of two bale stack groupings.

31.3.10.7 Fire department access roads for access across each end, with a clear space of not less than 100 ft (30 m) to adjacent bale stack rows or other exposed property, shall be provided.

31.3.10.8 Power-operated, shovel-type or scoop-type vehicles, dozers, bale movers or similar equipment shall be available for use in moving stored material for fire fighting.

31.3.10.9 Training of the plant emergency organization also shall include procedures and precautions to be observed by yard crews employing power equipment in fighting internal fires.

31.3.10.10 Portable fire extinguishers for Class A fires shall be provided in accordance with Section 13.6 on all vehicles operating in the storage yard in addition to the normal Class B units for the

vehicle.

31.3.10.11 Lightning protection shall be provided for the outside storage yard in accordance with NFPA 780

31.3.10.12 Outside storage yards shall be secured against unauthorized access in an approved manner.

31.3.10.13 Water supplies shall be provided in accordance with this *Code* .

Submitter Information Verification

Submitter Full Name: Gregory Harrington
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Street Address:
City:

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Submittal Date: Tue Oct 20 14:10:37 EDT 2015

Committee Statement

Committee Statement: The purpose of this proposal is to provide for the safe storage of biomass feedstock at biomass to ethanol manufacturing facilities. Existing general requirements for the storage of agricultural products are not sufficient for these types of operations. Some of the language proposed is from other comparable sections of NFPA 1. The storage arrangement dimensions is based upon current operations after shorter separation distances were found to be insufficient to retard fire spread. The requirements for securing the site in an approved manner and for the provision of lightning protection is in recognition of the two main causes of fires in this type of storage, arson and lightning strikes.

The revision is being moved as a committee input to solicit public comments and to allow further review at the second draft stage.

Response Message:

Public Input No. 241-NFPA 1-2015 [New Section after 31.3]

Ballot Results

This item has not been balloted

Committee Input No. 157-NFPA 1-2015 [Section No. 31.3.1.1]

31.3.1.1

The requirements of this chapter shall apply to the outside storage of the following:

(1) Lumber and wood panel products at retail and wholesale lumber storage yards

(2) Lumber and wood panel products at other than retail and wholesale storage yards

(3) Ties, poles, piles, posts, and other similar forest products at pressure-treating plant yards

(4) Outside storage of wood chips, hogged material, and wood by-products

(5) Logs

(6) Outside storage of biomass feedstocks

Submitter Information Verification

Submitter Full Name: Gregory Harrington
Organization: National Fire Protection Assoc
Street Address:
City:
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Submittal Date: Tue Oct 20 14:09:42 EDT 2015

Committee Statement

Committee Statement: The purpose of this submittal is to add storage requirements for biomass feedstock that is utilized for the manufacturing of ethanol. The stocks could include bales of corn stover, switch grass and/or hay. The general requirements for the storage of agricultural products are not appropriate for this activity.

The revision is being moved as a committee input to solicit public comments and to allow further review at the second draft stage.

Response Message:

Public Input No. 239-NFPA 1-2015 [Section No. 31.3.1.1]

Ballot Results

This item has not been balloted

Committee Input No. 161-NFPA 1-2015 [Section No. 45.1.2]

45.1.2 * -

Chapter 45 shall not apply to buildings completely protected by an approved automatic fire-extinguishing system; however, this exclusion does not preclude the need for good housekeeping.

Chapter 45 shall not apply to biomass feedstock regulated by Chapter 31.

Submitter Information Verification

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Submittal Date: Wed Oct 21 12:53:21 EDT 2015

Committee Statement

Committee Statement: This is part of a group of proposals suggesting language in Chapter 31 for the safe storage of biomass feedstock utilized in the manufacture of ethanol. The general requirements for the storage of agricultural products does not appropriately address the safety of biomass outside storage at biomass to ethanol facilities.

Response Message:

Public Input No. 245-NFPA 1-2015 [Section No. 45.1.2]

Ballot Results

This item has not been balloted

Committee Input No. 152-NFPA 1-2015 [Chapter 46]

Chapter 46 ~~Reserved~~

~~Reserved~~

Marijuana Growing, Processing or Extraction Facilities

See attached.

Supplemental Information

File Name	Description
Marijuana_and_NFPA_1_V2-_DL.docx	

Submitter Information Verification

Submitter Full Name: Kristin Bigda
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Submittal Date: Mon Oct 19 20:32:29 EDT 2015

Committee Statement

Committee Statement: Marijuana growing, processing, or extraction facilities present unique hazards and safety concerns that should be addressed in NFPA 1. Currently, there is no guidance in the Code specific to these types of facilities. The new chapter is being proposed as a Committee Input as is not complete at this time. The committee is requesting additional feedback and comments for the public. In addition, a task group has been established to further review and develop the requirements and will present its work during the Second Draft meeting.

Response Message:

Ballot Results

This item has not been balloted

Committee Input No. 137-NFPA 1-2015 [Chapter 52]

Chapter 52 – Stationary Storage Battery Systems

52.1 * – General.

Stationary storage battery systems having an electrolyte capacity of more than 100 gal (378.5 L) in sprinklered buildings or 50 gal (189.3 L) in unsprinklered buildings for flooded lead-acid, nickel-cadmium, and valve-regulated lead–acid (VRLA) batteries or 1000 lb (454 kg) for lithium-ion and lithium metal polymer batteries used for facility standby power, emergency power, or uninterrupted power supplies shall be in accordance with Chapter 52 and Table 52.1 .

Table 52.1 Battery Requirements

Nonrecombinant Batteries Recombinant Batteries Other Requirement Flooded Lead-Acid Flooded Nickel-Cadmium (Ni-Cd) Valve-Regulated Lead–Acid (VRLA) Lithium-Ion Lithium Metal Polymer Safety caps Venting caps Venting caps Self-resealing flame-arresting caps No caps No caps Thermal runaway management Not required Not required Required Not required Required Spill control Required Required Not required Not required Not required Neutralization Required Required Required Not required Not required Ventilation Required Required Required Not required Not required Signage Required Required Required Required Required Seismic control Required Required Required Required Required Fire detection Required Required Required Required Required

52.2 – Permits.

52.2.1 –

Permits, where required, shall comply with Section 1.12 .

52.2.2 –

Prior to installation, plans shall be submitted and approved by the AHJ.

52.3 – Safety Features.

52.3.1 – Safety Venting.

Batteries shall be provided with safety venting caps as follows in 52.3.1.1 through 52.3.1.3 .

52.3.1.1 – Nonrecombinant Batteries.

Vented lead-acid, nickel-cadmium, or other types of nonrecombinant batteries shall be provided with safety venting caps.

52.3.1.2 – Recombinant Batteries.

VRLA or other types of sealed, recombinant batteries shall be equipped with self-resealing flame-arresting safety vents.

52.3.1.3 –

Lithium-ion and lithium metal polymer batteries shall not require safety venting caps.

52.3.2 – Thermal Runaway.

VRLA, lithium-ion, and lithium metal polymer battery systems shall be provided with a listed device or other approved method to preclude, detect, and control thermal runaway.

52.3.3 – Location and Occupancy Separation.

52.3.3.1 –

Battery systems shall be permitted in the same room as the equipment that they support.

52.3.3.2 –

Battery systems shall be housed in a noncombustible, locked cabinet or other enclosure to prevent access by unauthorized personnel unless located in a separate equipment room accessible only to authorized personnel.

52.3.3.3 –

In other than assembly, educational, detention and correction facilities, health care, ambulatory health care, day care centers, residential board and care, and residential occupancies, battery systems shall be located in a room separated from other portions of the building by a minimum of a 1-hour fire barrier.

52.3.3.4 –

In assembly, educational, detention and correction facilities, health care, ambulatory health care, day care centers, residential board and care, and residential occupancies, battery systems shall be located in a room separated from other portions of the building by a minimum of a 2-hour fire barrier.

52.3.4 – Spill Control.

52.3.4.1 –

Rooms, buildings, or areas containing free-flowing liquid electrolyte in individual vessels having a capacity of more than 55 gal (208 L) or multiple vessels having an aggregate capacity exceeding 1000 gal (3785 L) shall be provided with spill control to prevent the flow of liquids to adjoining areas.

52.3.4.2 * - –

An approved method and materials for the control of a spill of electrolyte shall be provided that will be capable of controlling a spill from the single largest vessel.

52.3.4.3 –

VRLA, lithium-ion, lithium metal polymer, or other types of sealed batteries with immobilized electrolyte shall not require spill control.

52.3.5 – Neutralization.

52.3.5.1 * - –

An approved method to neutralize spilled electrolyte shall be provided.

52.3.5.2 –

For nonrecombinant batteries and VRLA batteries, the method shall be capable of neutralizing a spill from the largest battery to a pH between 7.0 and 9.0.

52.3.5.3 –

Lithium-ion and lithium metal polymer batteries shall not require neutralization.

52.3.6 * - – Ventilation.

For flooded lead-acid, flooded nickel-cadmium, and VRLA batteries, ventilation shall be provided for rooms and cabinets in accordance with the mechanical code and one of the following:

(1) - The ventilation system shall be designed to limit the maximum concentration of hydrogen to 1.0 percent of the total volume of the room during the worst-case event of simultaneous “boost” charging of all the batteries, in accordance with nationally recognized standards.

(2) - Continuous ventilation shall be provided at a rate of not less than 1 $ft^3/min/ft^2$ (5.1 $L/sec/m^2$) of floor area of the room or cabinet.

52.3.6.1 –

Lithium-ion and lithium metal polymer batteries shall not require ventilation.

52.3.7 – Environment.

The battery environment shall be controlled or analyzed to maintain temperature in a safe operating range for the specific battery technology used.

52.3.8 – Signs.

~~52.3.8.1 –~~

~~Doors or accesses into the following shall be provided with approved signs:~~

(1) ~~- Battery storage buildings~~

(2) ~~- Rooms containing stationary storage battery systems~~

(3) ~~- Other areas containing stationary storage battery systems~~

~~52.3.8.2 –~~

~~For rooms that contain Valve-Regulated Lead–Acid (VRLA), Lithium-Ion, or Lithium Metal Polymer batteries, the signs required by 52.3.8.1 shall state the following:~~

~~This room contains:~~

(1) ~~- Stationary storage battery systems~~

(2) ~~- Energized electrical circuits~~

~~52.3.8.3 –~~

~~For rooms that contain Flooded Lead-Acid or Flooded Nickel-Cadmium (Ni-Cd) batteries, the signs required by 52.3.8.1 shall state the following:~~

~~This room contains:~~

(1) ~~- Stationary storage battery systems~~

(2) ~~- Energized electrical circuits~~

(3) ~~- Corrosive battery electrolyte~~

~~52.3.8.4 –~~

~~Battery cabinets shall be provided with exterior labels that identify the manufacturer and model number of the system and electrical rating (voltage and current) of the contained battery system.~~

~~52.3.8.5 –~~

~~Signs shall be provided within battery cabinets to indicate the relevant electrical, chemical, and fire hazard.~~

~~52.3.9 – Seismic Protection.~~

~~In seismically active areas, battery systems shall be seismically braced in accordance with the building code.~~

~~52.3.10 – Smoke Detection.~~

~~An approved automatic smoke detection system shall be installed in such areas and supervised by an approved central, proprietary, or remote station service or a local alarm that will give an audible signal at a constantly attended location.~~

See attachment.

Supplemental Information

File Name	Description
Chapter_52_Stationary_Storage_Battery_Systems_with_HH_8-28_email.docx	

Submitter Information Verification

Submitter Full Name: Kristin Bigda
Organization: National Fire Protection Assoc
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Submittal Date: Mon Oct 19 12:52:09 EDT 2015

Committee Statement

Committee Statement: Proposed Committee Input expands the scope of Chapter 52 to address energy storage systems (ESS) and not just stationary storage battery systems. The ESS requirements should cover battery systems, and/or fuel cells and other technologies such as chemical, mechanical and thermal that are being explored for use in today' energy conscience environment. It is desirable for the requirements to be compatible with other model codes and the National Electrical Code. UL 9540 Outline of Investigation for Energy Storage Systems and Equipment should be considered as a listing standard as it addresses a wide variety of energy storage technologies.

The use of ESS is rapidly expanding across North America and AHJs are facing the challenge of having to evaluate installations of new ESS technologies and applications in locations throughout the built environment. These include chemical (i.e. hydrogen fuel cells), mechanical (i.e. fly-wheel systems) and thermal technologies. Currently there are few if any fire code requirements in place to provide guidance on how to mitigate potential hazards. As this is being proposed as a Committee Input, additional comments and feedback from the public is anticipated and encouraged.

Response Message:

Public Input No. 285-NFPA 1-2015 [Section No. 52.3.5]

Public Input No. 172-NFPA 1-2015 [New Section after 52.3.10]

Public Input No. 250-NFPA 1-2015 [Chapter 52 [Title Only]]

Public Input No. 291-NFPA 1-2015 [New Section after 52.3.8.3]

Public Input No. 284-NFPA 1-2015 [New Section after 52.3.3.4]

Public Input No. 279-NFPA 1-2015 [New Section after 52.1]

Public Input No. 280-NFPA 1-2015 [Section No. 52.1]

Public Input No. 271-NFPA 1-2015 [New Section after 52.1]

Public Input No. 287-NFPA 1-2015 [Section No. 52.3.6]

Public Input No. 270-NFPA 1-2015 [New Section after 52.1]

Public Input No. 281-NFPA 1-2015 [Section No. 52.3.1]

Public Input No. 260-NFPA 1-2015 [Section No. 1.12.8]

Public Input No. 282-NFPA 1-2015 [Section No. 52.3.2]

Public Input No. 262-NFPA 1-2015 [Section No. 52.1]

Public Input No. 269-NFPA 1-2015 [Section No. 2.3.17]

Public Input No. 267-NFPA 1-2015 [Section No. A.52.1]

Public Input No. 289-NFPA 1-2015 [Section No. A.52.3.6]

Ballot Results

This item has not been balloted

Committee Input No. 149-NFPA 1-2015 [Section No. 53.3.1.1]

53.3.1.1 General.

Refrigeration systems shall be operated and maintained in a safe and operable condition, free from accumulations of oil, dirt, waste, excessive corrosion, other debris, or leaks, and in accordance with ASHRAE 15 and the mechanical code. Ammonia refrigerator systems shall be operated and maintained in accordance with ANSI/IIAR 6, *Maintenance and Inspection of Closed-Circuit Ammonia Refrigeration Systems*, and ANSI/IIAR 7, *Developing Operating Procedures for Closed-Circuit Ammonia Mechanical Refrigerating Systems*.

Submitter Information Verification

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Submittal Date: Mon Oct 19 20:05:59 EDT 2015

Committee Statement

Committee Statement: IIAR 6 is a new standard that provides regulations for maintenance and inspection of closed-circuit ammonia refrigeration systems. ANSI/IIAR 6 is not yet complete, but it is anticipated to be complete prior to conclusion of the current NFPA 1 cycle.

Response Message:

Ballot Results

This item has not been balloted

Committee Input No. 162-NFPA 1-2015 [Chapter 55]

Chapter 55

~~– Reserved~~ ~~Reserved~~

- Cleaning and Purging of Flammable Gas Piping Systems

55.1 Cleaning and purging activities for new and existing flammable gas piping found in electric generating plants and in industrial, institutional, and commercial applications shall comply with NFPA 56, *Standard for Fire and Explosion Prevention During Cleaning and Purging of Flammable Gas Piping Systems .*

Submitter Information Verification

Submitter Full Name: Kristin Bigda
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Street Address:
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Submittal Date: Thu Oct 22 10:25:49 EDT 2015

Committee Statement

Committee Statement: NFPA 56 applies to fire and explosion prevention during cleaning and purging activities for new and existing flammable gas piping found in electric-generating plants and in industrial, institutional, and commercial applications. NFPA 56 was developed in direct response to the explosion and subsequent fatalities at the Kleen Energy natural gas-fired power plant in Middletown, CT. The committee agreed that NFPA 56 addresses an important subject that should be referenced in some part in NFPA 1. Additional review of NFPA 56 will be completed prior to the Second Draft stage.

Response Message:

Ballot Results

This item has not been balloted

Committee Input No. 144-NFPA 1-2015 [New Section after 60.5.2]

60.5.3 Egress. Egress from areas required to comply with Protection Level 1, Protection Level 2, Protection Level 3, Protection Level 4 or Protection Level 5 shall comply with 60.5.3, and egress from areas required to comply with Protection Level 5 shall also comply with 34.3.7 of NFPA 5000. [**5000:** 34.3.2.4]

60.5.3.1 Travel Distance Limit. Travel distance to an exit from areas required to comply with Protection Level 1 through Protection Level 5 shall not exceed the distance given in Table 60.5.3.1, measured as required in Section 11.6.3 of NFPA 5000.[**5000:** 34.3.2.4.1]

Table 60.5.3.1 [**5000:** Table 34.3.2.4.1]

<<Insert Table 34.3.2.4.1 from NFPA 5000 2018 edition >>

60.5.3.2 Capacity of Means of Egress. Egress capacity for high hazard contents areas shall be based on 0.7 in. (18 mm). per person for stairs or 0.4 in. (10 mm) per person for level components and ramps in accordance with 14.8.3.1. [**5000:** 34.3.2.4.2]

60.5.3.3 Number of Means of Egress. Not less than two means of egress shall be provided from each building, or portion thereof, required to comply with Section 60.2 through 60.6, unless rooms or spaces do not exceed 200 ft2 (18.6 m2), have an occupant load not exceeding three persons, and have a travel distance to the room door not exceeding 25 ft (7.6 m). [**5000:** 34.3.2.4.3]

60.5.3.4 Dead Ends. Means of egress, for other than rooms or spaces that do not exceed 200 ft2 (18.6 m2), have an occupant load not exceeding three persons, and have a travel distance to the room door not exceeding 25 ft (7.6 m), shall be arranged so that there are no dead ends in corridors. [**5000:** 34.3.2.4.4]

60.5.3.5 Doors. Doors serving high hazard contents areas with occupant loads in excess of five shall be permitted to be provided with a latch or lock only if the latch or lock is panic hardware or fire exit hardware complying with 14.5.3.4. [**5000:** 34.3.2.4.5]

60.5.3.6 Common Path of Travel Distance Limit. The common path of travel distance from areas required to comply with Protection Level 1 through Protection Level 5 shall not exceed the distance given in Table 60.5.3.6, measured as required in NFPA 5000 11.6.3. [**5000:** 34.3.2.4.6].

Table 60.5.3.6 Common Path of Travel Distance Limits

Hazard Level	Distance (feet)	Distance (meters)
1	25	8
2	25	8
3	25	8
4	75	23
5	75	23

[**5000:** Table 34.3.2.4.6]

Submitter Information Verification

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Submittal Date: Mon Oct 19 15:07:01 EDT 2015

Committee Statement

Committee Statement: Because no specific limit for common path of travel exists, inappropriate distances could be used for this critical means of egress element.

Basis for 25 foot distance: For Hazard Levels 1-3 the primary hazard is a physical one. During fire conditions, physical hazards (which may be open or closed use or storage, can dramatically and rapidly change fire characteristics. Therefore the distance one much travel until there are two distinct paths of travel to an exit must be limited in length. 25 feet is a reasonable distance limit for such conditions.

Basis for 75 foot distance. Per NFPA 101, the common path of travel in a sprinklered industrial or storage occupancy is 100 feet (50 feet if un-sprinklered). All PL-4 and PL-5 areas are required to be sprinklered regardless, so a common path limit for a non-sprinklered PL-4, 5 area need not be developed – it is not allowed. As a high hazard area, the common path distance for a PL-4 or PL-5 area should be less than that allowed for a storage or industrial occupancy. During normal conditions, the health hazards associated with toxic solids and liquids are required to be controlled – that is there are robust requirements for containers, piping, etc. that are already required both by NFPA 400 and applicable fire codes as well as various health hazard requirements (related to industrial hygiene) that prevent the release of toxic or highly toxic solids and liquids into occupied areas during normal operation. During a fire condition, release is possible, and egress is needed prior to the development of untenable conditions, either due to products of combustion and heat from the fire or due to release of the toxic or highly toxic solids or liquids due to a fire induced breach of their containment. The fire sprinklers would frequently be expected to eliminate a release, but that is not always the case. This possible release warrants a reduction in the 100 foot common path of travel distance from that allowed for the base occupancies, but not so much as would be required for physical hazards (PL 1-3 areas) and more than would be allowed for an un-sprinklered base occupancy (50 feet). Therefore 75 feet is a reasonable distance for the common path of travel distance for a sprinklered PL-4 health hazard area.

Public Input No. 293-NFPA 1-2015 [New Section after 60.5.2]

Ballot Results

This item has not been balloted

Committee Input No. 130-NFPA 1-2015 [Section No. 63.9]

~~63.9 – Insulated Liquid Carbon Dioxide Systems.~~

~~Insulated liquid carbon dioxide systems shall comply with Chapter 13 of NFPA 55.~~

See attachment.

Supplemental Information

File Name	Description
C02_CI.docx	

Submitter Information Verification

Submitter Full Name: Kristin Bigda
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Submittal Date: Mon Oct 19 11:45:25 EDT 2015

Committee Statement

Committee Statement: The use of CO2 and other simple asphyxiants has become prevalent in restaurants, mercantile, mercantile and other non-industrial facilities that utilize these gases for beverage dispensing and other applications. There have been fatalities in some of these facilities due to asphyxiation. The draft was developed through a task force made up of industry associations, interested individuals and regulators. The text is being proposed in the form of a Committee Input as additional comments from the public are requested and encouraged.

Response Message:

Public Input No. 225-NFPA 1-2015 [Global Input]

Ballot Results

This item has not been balloted

Committee Input No. 113-NFPA 1-2015 [New Section after E.2.5]

Annex F Fire Fighter Breathing Air Replenishment Systems

This annex is not a part of the requirements of this NFPA document unless specifically adopted by the AHJ.

F.1 General.

Where required by the AHJ, fire fighter breathing air replenishment systems shall comply with Appendix F of the Uniform Plumbing Code.

Submitter Information Verification

Submitter Full Name: Gregory Harrington
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Submittal Date: Wed Oct 14 14:14:49 EDT 2015

Committee Statement

Committee Statement: The committee input is intended to solicit public comments on the proposed addition of criteria to address fire fighter breathing air replenishment systems, as contained in Appendix F of the UPC.
Response Message:

Ballot Results

This item has not been balloted

Committee Input No. 61-NFPA 1-2015 [Section No. F.1.2.3]

F.1.2.3 API Publications.

American Petroleum Institute, 1220 L Street NW, Washington, DC 20005-4070.

"An Engineering Analysis of the Effects of Oxygenated Fuels on Marketing Vapor Recovery Equipment."

API 12R1, *Setting, Maintenance, Inspection, Operation, and Repair of Tanks in Production Service*.

API 620, *Recommended Rules for the Design and Construction of Large, Welded, Low-Pressure Storage Tanks,* 11th Edition, 2012.

API Standard 650, *Welded Steel Tanks for Oil Storage,* 11th Edition, 2011.

API 653, *Tank Inspection, Repair, Alteration, and Reconstruction,* 4th edition, 2012.

API 1501, *Filtration and Dehydration of Aviation Fuels,* 1st Edition, 1965.

API RP 1615, *Installation of Underground Petroleum Storage Systems,* 6th Edition, 2011

API 2015, *Cleaning Petroleum Storage Tanks,*6th Edition, reaffirmed 2016.

API 2218, *Fireproofing Practices in Petroleum and Petrochemical Processing Plants,* 2nd Edition, 1999.

API 2350, *Overfill Protection for Storage Tanks in Petroleum Facilities,* 4th Edition, 2012.

API RP 1621, *Bulk Liquid Stock Control at Retail Outlets,* 2001.

API 2003, *Protection Against Ignition Arising Out of Static, Lightning, and Stray Currents,* 7th Edition, 2008.

Submitter Information Verification

Submitter Full Name: Gregory Harrington
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Submittal Date: Thu Sep 24 11:22:30 EDT 2015

Committee Statement

Committee Statement: API references to be updated at second draft stage (NFPA 30 extracts).
Response Message:

Ballot Results

This item has not been balloted

Committee Input No. 64-NFPA 1-2015 [Section No. F.1.2.6]

F.1.2.6 ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM *Manual on Flash Point Standards and Their Use*.

ASTM A380/A380M, *Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems*, 2013.

ASTM D 2859, *Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials*, 2006, (2011).

ASTM D 4206, *Standard Test Method for Sustained Burning of Liquid Mixtures using the Small-Scale Open Cup Apparatus*, 1996 (2007).

ASTM D 4207, *Standard Test Method for Sustained Burning of Low Viscosity Liquid Mixtures by the Wick Test, withdrawn*, last edition 1991.

ASTM D 6469, *Standard Guide for Microbial Contamination in Fuels and Fuel Systems*, 2012.

ASTM E 84, *Standard Test Method of Surface Burning Characteristics of Building Materials*, 2013.

ASTM E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, 2012a.

ASTM E 502, *Standard Test Method for Selection and Use of ASTM Standards for the Determination of Flash Point of Chemicals by Closed Cup Methods*, 2007e1.

ASTM E 814, *Standard Test Method for Fire Tests of Through Penetration Fire Stops*, 2011a.

ASTM E 1226, *Standard Test Method for Explosibility of Dust Clouds*, 2010.

ASTM E 1352, *Standard Test Method for Cigarette Ignition Resistance of Mock-Up Upholstered Furniture Assemblies*, 2008a.

ASTM E 1353, *Standard Test Methods for Cigarette Ignition Resistance of Components of Upholstered Furniture*, 2008ae1.

ASTM E 1354, *Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter*, 2013.

ASTM E 1472, *Standard Guide for Documenting Computer Software for Fire Models*, 2007 (Withdrawn).

ASTM E 1491, *Test Method for Minimum Autoignition Temperature of Dust Clouds*, 2006.

ASTM E 1537, *Standard Test Method for Fire Testing of Upholstered Furniture*, 2012.

ASTM E 1590, *Standard Test Method for Fire Testing of Mattresses*, 2012.

ASTM E 2019, *Standard Test Method for Minimum Ignition Energy of a Dust Cloud in Air*, 2003 (2007).

ASTM E 2021, *Standard Test Method for Hot-Surface Ignition of Dust Layers*, 2009.

ASTM E 2030, *Guide for Recommended Uses of Photoluminescent (Phosphorescent) Safety Markings*, 2009a.

ASTM E 2174, *Standard Practice for On-Site Inspection of Installed Fire Stops*, 2010ae1.

Submitter Information Verification

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Submittal Date: Thu Sep 24 11:30:31 EDT 2015

Committee Statement

Committee Statement: ASTM references to be updated at second draft stage (numerous extracts).

Response Message:

Public Input No. 190-NFPA 1-2015 [Section No. F.1.2.6]

Ballot Results

This item has not been balloted

Committee Input No. 71-NFPA 1-2015 [Section No. F.1.2.16]

F.1.2.16 PEI Publications.

Petroleum Equipment Institute, P.O. Box 2380, Tulsa, OK 74101-2380.

PEI RP100, *Recommended Practices for Installation of Underground Liquid Storage Systems*, 2011.

PEI RP200, *Recommended Practices for Installation of Aboveground Storage Systems for Motor Vehicle Fueling*, 2008.

Submitter Information Verification

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Submittal Date: Thu Sep 24 11:58:05 EDT 2015

Committee Statement

Committee Statement: PEI publications to be updated at second draft stage (NFPA 30 extracts).
Response Message:

Ballot Results

This item has not been balloted

Committee Input No. 72-NFPA 1-2015 [Section No. F.1.2.19]

F.1.2.19 STI Publications.

Steel Tank Institute, 570 Oakwood Road, Lake Zurich, IL 60047.

STI P3, *Specification and Manual for External Corrosion Protection of Underground Steel Storage Tanks*.

STI RP 01-69, *Recommended Practice for Control of External Corrosion of Underground or Submerged Metallic Piping Systems.*

STI RP 892-91, *Recommended Practice for Corrosion Protection of Underground Piping Networks Associated with Liquid Storage and Dispensing Systems*.

STI RP 1632, *Cathodic Protection of Underground Petroleum Storage and Piping Systems.*

STI SP001, *Standard for Inspection of Aboveground Storage Tanks*

STI R 931, *Double Wall AST Installation and Testing Instructions*.

STI RP R011, *Recommended Practice for Anchoring of Steel Underground Storage Tanks*.

Keeping Water Out of Your Storage System.

Submitter Information Verification

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Submittal Date: Thu Sep 24 12:01:03 EDT 2015

Committee Statement

Committee Statement: STI publications to be updated at second draft stage (NFPA 30/30A extracts).
Response Message:

Ballot Results

This item has not been balloted

Committee Input No. 73-NFPA 1-2015 [Section No. F.1.2.21]

F.1.2.21 UL Publications.

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

ANSI/UL 30, *Standard for Metal Safety Cans*, 1995, revised 2009.

ANSI/UL 142, *Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids*, 2006, revised 2010.

ANSI/UL 197, *Standard for Commercial Electric Cooking Appliances*, 2010.

ANSI/UL 199, *Standard for Automatic Sprinklers for Fire-Protection Service*, 2005, revised 2008.

ANSI/UL 263, *Standard for Fire Tests of Building Construction and Materials*, 2003, revised 2011.

ANSI/UL 296A, *Standard for Waste Oil-Burning Air-Heating Appliances*, 2010.

ANSI/UL 299, *Dry Chemical Fire Extinguishers*, 2002, revised 2009.

ANSI/UL 300, *Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment*, 2005, revised 2010.

ANSI/UL 711, *Standard for Rating and Fire Testing of Fire Extinguishers*, 2004, revised 2009.

ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, 2008, revised 2010.

ANSI/UL 737, *Standard for Fireplace Stoves*, 2011.

ANSI/UL 896, *Standard for Oil-Burning Stoves*, 1993.

ANSI/UL 913, *Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III Division 1, Hazardous (Classified) Locations,* 2006, revised 2011.

ANSI/UL 923, *Standard for Microwave Cooking Appliances*, 2008.

ANSI/UL 969, *Standard for Marking and Labeling Systems*, 1995, revised 2008.

ANSI/UL 1040, *Standard for Fire Test of Insulated Wall Construction*, 1996, revised 2007.

ANSI/UL 1313, *Nonmetallic Safety Cans for Petroleum Products*, 1993, revised 2007.

ANSI/UL 1479, *Standard for Fire Tests of Through-Penetration Firestops*, 2003, revised 2010.

ANSI/UL 1709, *Standard for Rapid Rise Fire Tests of Protection Materials for Structural Steel*, 2011.

ANSI/UL 1715, *Standard for Fire Test of Interior Finish Material*, 1997, revised 2008.

ANSI/UL 1746, *Standard for External Corrosion Protection Systems for Steel Underground Storage Tanks*, 2007.

UL 1975, *Standard for Fire Tests for Foamed Plastics Used for Decorative Purposes*, 2006.

ANSI/UL 2085, *Standard for Protected Aboveground Tanks for Flammable and Combustible Liquids*, 1997, revised 2010.

ANSI/UL 2129, *Halocarbon Clean Agent Fire Extinguishers*, 2005, revised 2011.

UL Subject 199B, *Outline of Investigation for Control Cabinets for Automatic Sprinkler Systems Used for Protection of Commercial Cooking Equipment*, 2006.

UL Subject 199E, *Outline of Investigation for Fire Testing of Sprinklers and Water Spray Nozzles for Protection of Deep Fat Fryers*, 2004.

UL Subject 2162, *Outline of Investigation for Commercial Wood-Fired Baking Ovens*, 2004.

UL Subject 2436, *Outline of Investigation for Spill Containment For Stationary Lead Acid Battery Systems*, 2006.

UL Subject 2728, *Outline of Investigation for Pellet Fuel Burning Cooking Appliances*, 2009.

Submitter Information Verification

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Submittal Date: Thu Sep 24 12:03:53 EDT 2015

Committee Statement

Committee Statement: UL publications to be updated at second draft stage (numerous extracts).
Response Message:

Public Input No. 268-NFPA 1-2015 [Section No. F.1.2.21]

Ballot Results

This item has not been balloted