NATIONAL FIRE PROTECTION ASSOCIATION

The leading information and knowledge resource on fire, electrical and related hazards

NFPA Technical Committee on Lightning Protection

NFPA 780 (A2019 cycle) Second Draft Meeting

AGENDA

Savanah, Georgia

October 15-17, 2018

Item No.	Subject
17-9-1	Call to Order
17-9-2	Introduction of Members and Guests
17-9-3	Approval of Previous Meeting Minutes
17-9-4	Review of Regulations and Committee Actions
17-9-5	Task Group Reports
17-9-6	Processing of Public Comments
17-9-7	Old Business
17-9-8	New Business
17-9-9	Adjournment

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Chairman's Report for the TC on Lightning Protection

NFPA 780 First Draft Meeting

1) Date(s) and location of meeting: October 17 – 20, 2017, Fort Collins, CO.

2) List names of guests in attendance:

Porter, Christine	Chair	Intertek Testing Services
Barrack, Samuel	Principal	Consolidated Nuclear Security, LLC
Batchelor, Christopher	Principal	US Department of the Navy
Campbell, Joanie	Principal	US Department of the Air Force
Covino, Josephine	Principal	US Department of Defense
DeGregoria, Joseph	Principal	UL LLC
Guthrie, Mitchell	Principal	Engineering Consultant
Harger, Mark	Principal	Harger Lightning & Grounding
Heary, William	Principal	Heary Brothers Lightning Protection
Humeniuk, Stephen	Principal	United Lightning Protection Association,
Johnson II, Carl	Principal	AVCON, Inc.
Kaiser, Bruce	Principal	Lightning Master Corporation
Larter, Simon	Principal	Dobbyn Lightning Protection
Melton, Robley	Principal	Alliance for Telecommunications Industry
Morgan, Mark	Principal	East Coast Lightning Equipment, Inc.
Pettross, Luke	Principal	Lightning Eliminators & Consultants Inc.
Thomson, Ewen	Principal	Marine Lightning Protection Inc.
Tobias, John	Principal	US Department of the Army
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Portfleet, George	Alternate	United Lightning Protection Association,

Svendsen, Paul	Alternate	National Lightning Protection Corporation
Youtsey, Philip	Alternate	Lightning Protection Institute
Coache, Christopher	Staff Liaison	National Fire Protection Association
Roux, Richard	Staff Liaison	National Fire Protection Association

GUESTS:

Dobbyn, Tom	Dobbyn Lightning Protection
Graves, Chuck	FAA
Carlson, Chris	Harger Lightning & Grounding
Choi, Younjin	OMNI LPS CO, LTD.
Chung, Youngki	OMNI LPS CO, LTD.
Bouchard, Rich	ULLC
Kohnken, Ken	Orica
Kithil, Richard	National Lightning Safety Inst.

3) List names of guests addressing the Panel/TC, the subject of their address, and the length of time they spoke:

   Youngki Chung of Omni LPS speaking in support of several of his submitted inputs (early streamer emissions), 15 minutes with additional 15 minutes for questions.

4) Number of Public Inputs acted upon: 284

5) Number of First Revisions created: 131

6) List any Task Groups appointed to work subsequent to the Second Draft Meeting, along with the names of members of the Task Group(s): none

7) List any Public Inputs or First Revisions, in your opinion that needs to be referred to another TC for information or correlation: none

8) List any Public Inputs or First Revisions that should be referred to the Toxicity Advisory Committee: none

9) List all Public Inputs or First Revisions related to combustibles in plenums or other air handling spaces: none

10) Identify any issues that should be brought to the attention of the NFPA Research Foundation for their input and assistance: The CSST grounding/lighting strike issue is still ongoing with not only NFPA 780 but also NEC and NFPA 54.

Public Comment No. 20-NFPA 780-2018 [New Section after 4.6.1.5]

Add a new A.4.6.1.5

A.4.6.1.5 Where handrails are designed to be an intended strike termination device it is important to caution that touch and sideflash issues could result. Signage or other methods should be provided to warn the public not to touch or stand near the handrails when lightning is probable.

Statement of Problem and Substantiation for Public Comment

By adding the new clause to allow handrails to serve as a strike termination device, it is important to point out the touch and sideflash safety issues associated with being near the handrail when lightning is in the area. LEMP will also be a potential source of touch voltages that will be a personal safety threat.

Related Item

• FR-57

Submitter Information Verification

Submitter Full Name: Mitchell Guthrie
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Submittal Date: Wed May 09 14:25:09 EDT 2018

Public Comment No. 22-NFPA 780-2018 [Section No. 4.7.11.3]

4.7.11.3

Where only one strike termination device is required on an object, at least one main-size conductor shall connect the strike termination device to a ~~main~~ roof conductor providing two or more paths to ground from that location in accordance with Section 4.9 and 4.9.2.

Statement of Problem and Substantiation for Public Comment

Primarily editorial comment that further clarifies which main conductor the 2nd main conductor refers to.

Related Item

• FR-55

Submitter Information Verification

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Submittal Date: Wed May 09 16:26:20 EDT 2018

Public Comment No. 7-NFPA 780-2018 [Section No. 4.19.1]

4.19.1 General.

The metal framework of a structure shall be permitted to be utilized as the main conductor of a lightning protection system if it is equal to or greater than 3⁄16 in. (4.8 mm) in thickness and is electrically continuous, or it is made electrically continuous by methods specified in 4.19.3.

If the intent of paragraph 4.19.1 of NFPA 780 is to eliminate the requirement for both the main conductor and the air terminals on the lightning protection system, then I believe that Paragraph 4.19.1 should read as follows:

4.19.1 General. The metal roof structural members of a structure shall be permitted to function as the main conductor and air terminals of a lightning protection system if each metal roof structural member of a structure is equal to or greater than 3/16 inches (4.8 mm) in thickness and is electrically continuous. Or the metal roof structural members noted above in this paragraph (paragraph 4.19.1) are made electrically continuous by the methods specified in 4.19.3.

Statement of Problem and Substantiation for Public Comment

to clarify the intent of 4.19.1

Related Item

• no related item

Submitter Information Verification

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Submittal Date: Wed May 02 09:55:33 EDT 2018

Public Comment No. 2-NFPA 780-2018 [Section No. 7.2.1 [Excluding any Sub-Sections]]

A primary means to reduce the ignition of flammable vapors shall be to minimize the exposure of locations that experience a direct strike ~~or~~ , Lightning Electromagnetic Pulse (LEMP), or secondary arcing. Flammable air–vapor mixtures shall be prevented, to the greatest possible extent, from accumulating outside such structures.

Statement of Problem and Substantiation for Public Comment

The comment acknowledges that LEMP is also a threat that can result in arcing in a space containing a flammable atmosphere, especially in non-metallic tanks.

Related Item

• FR 116

Submitter Information Verification

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Submittal Date: Wed Apr 18 15:51:49 EDT 2018

Public Comment No. 25-NFPA 780-2018 [Section No. 7.3.7.3]

7.3.7.3

A metal tank shall be grounded by one of the following methods:

(1) A tank shall be connected without insulated joints to a grounded metallic piping system [i.e., electrically continuous, buried, and in direct contact with earth~~ for at least 10 ft (3 m)~~].

(2) A vertical cylindrical tank shall rest on earth or concrete and shall be at least 20 ft (6 m) in diameter, or shall rest on bituminous pavement and shall be at least 50 ft (15 m) in diameter.

(3) A tank shall be grounded through a minimum of two grounding electrodes, as described in Section 4.13, at maximum 100 ft (30 m) intervals along the perimeter of the tank.

(4) A tank installation using an insulating membrane beneath for environmental or other reasons shall be grounded as in 7.3.7.3(4).

Statement of Problem and Substantiation for Public Comment

The Committee Statement adding the text deleted by this comment provides a description of “grounded metallic piping system” that is consistent with 4.13.2.3.1. However, this statement uses the burial depth value but the buried metallic piping is seldom buried at a depth of 10 feet. A more realistic comparison would be to use the 12 foot length for radials.
It also infers only one grounding electrode of minimum length is necessary, which is in conflict with 7.3.7.3 (3), which requires a minimum of 2 electrodes..

Related Item

• FR-29

Submitter Information Verification

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Submittal Date: Wed May 09 17:23:28 EDT 2018

Public Comment No. 26-NFPA 780-2018 [Section No. 7.4.3.2.3.1]

7.4.3.2.3.1

Any conductive seal assembly components, including springs, scissor assemblies, and seal membranes, that are not fully submerged shall be electrically insulated from the tank roof or bonded to the roof ~~in accordance with the requirements of Section 4~~ . ~~16.~~

Statement of Problem and Substantiation for Public Comment

The bonding requirements of 4.16 were not developed to ensure there would be no arcing but to limit any arcing to energies that will not result in ignition of building materials. In this case, procedures should be implemented to ensure there is no sparking in the environment that may contain a flammable atmosphere.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 27-NFPA 780-2018 [Section No. 7.4.3.2.4.1]	
Public Comment No. 30-NFPA 780-2018 [Section No. 7.4.3.3.3]	

Related Item

- FR-32

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Submittal Date: Wed May 09 21:47:13 EDT 2018

Public Comment No. 27-NFPA 780-2018 [Section No. 7.4.3.2.4.1]

7.4.3.2.4.1

Any gauge or guide pole components, telescoping legs, or assemblies that penetrate the tank's floating roof shall be electrically insulated from the roof or bonded to the roof ~~in accordance with the requirements of Section 4 . 16.~~

Statement of Problem and Substantiation for Public Comment

The bonding requirements of 4.16 were not developed to ensure there would be no arcing but to limit any arcing to energies that will not result in ignition of building materials. It should be ensured there is no arcing in an environment containing flammable vapor.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 26-NFPA 780-2018 [Section No. 7.4.3.2.3.1]	Similar application
Public Comment No. 30-NFPA 780-2018 [Section No. 7.4.3.3.3]	

Related Item

• FR-110

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Public Comment No. 30-NFPA 780-2018 [Section No. 7.4.3.3.3]

~~7.4.3.3.3~~ –

~~Metal bodies shall be bonded as required by Section 4.16 .~~

Statement of Problem and Substantiation for Public Comment

The bonding requirements of 4.16 were not developed to ensure there would be no arcing but to limit any arcing to energies that will not result in ignition of building materials. It should be ensured there is no arcing in an environment containing flammable vapor.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 26-NFPA 780-2018 [Section No. 7.4.3.2.3.1]	
Public Comment No. 27-NFPA 780-2018 [Section No. 7.4.3.2.4.1]	

Related Item

• FR-32 • FR-116

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Submittal Date: Wed May 09 22:39:05 EDT 2018

Public Comment No. 29-NFPA 780-2018 [Section No. 7.4.4.2]

~~7.4.4.2~~ –

~~Aboveground nonmetallic tanks shall be protected as described in Section 7.3 .~~

Statement of Problem and Substantiation for Public Comment

This clause must be deleted as specific requirements for non-conductive tanks are proposed in new 7.4.5.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 28-NFPA 780-2018 [Section No. 7.4.5.6]	Proposed new text
Public Comment No. 23-NFPA 780-2018 [Section No. 7.4.5.8]	Proposed new text
Public Comment No. 24-NFPA 780-2018 [Section No. 7.4.5.4]	Proposed new text

Related Item

• FR-116

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Submittal Date: Wed May 09 22:28:34 EDT 2018

Public Comment No. 17-NFPA 780-2018 [Section No. 7.4.5]

7.4.5 Nonmetallic Tanks.

7.4.5.1

~~Each tank appurtenance with an insulating gasket, such as a thief hatch, shall be equipped with a flexible bonding conductor across the insulating gasket.~~

~~**7.4.5.2** * –~~

~~On each tank constructed of nonconductive material, each metallic appurtenance shall be bonded to all other metallic appurtenances with a minimum of main-size Class I conductor.~~

~~**7.4.5.2.1** –~~

~~Metal bolts on a nonconductive manway shall not be required to be bonded as described in this section.~~

~~**7.4.5.3** –~~

~~The bonded mass of appurtenances shall be bonded to ground or to a grounded structure.~~

~~**7.4.5.4** –~~

~~Tanks installed in a multi-tank battery shall be electrically bonded to all other tanks through Class I main conductors or through connection by electrically contiguous metal walkways.~~

~~**7.4.5.5** –~~

~~Each tank or tank battery shall be protected with air terminals installed to meet the requirements of Chapter 4.~~

~~**7.4.5.6** –~~

~~Single main and down conductors and single paths to ground for individual air terminals shall be allowed.~~

~~**7.4.5.7** –~~

~~Bonding jumpers shall be installed across insulating joints, flanges, and valves.~~

~~**7.4.5.8** – Stored Product Bonding.~~

~~**7.4.5.8.1** –~~

~~Each tank containing a flammable liquid or liquid capable of producing flammable vapors or gas shall be equipped with an internal static drain (inductive neutralizer) as described in 8.1.2 of NFPA 77.~~

~~**7.4.5.8.2** –~~

~~The static drain shall be electrically bonded at its upper end to the thief hatch collar or other grounded metal appurtenance or conductor.~~

~~**7.4.5.8.3** –~~

~~The end-to-end electrical resistance of the static drain, including connectors, shall not exceed 1.0 ohm.~~

~~**7.4.5.8.4** –~~

~~The static drain shall be of sufficient length and rigidity that it penetrates the surface of the contained product at all operating fill levels.~~

Nonmetallic tanks should be provided with means of electromagnetic shielding that reduce the electric fields inside the tanks so that any sparking generated by Lightning Electromagnetic Pulses LEMPs will have energies below the minimum ignition energy of the combustible vapors likely to be in such tanks.

Statement of Problem and Substantiation for Public Comment

Experienced by most people as static interference on radios or TVs during thunderstorms, electromagnetic waves from lightning strikes or Lightning Electromagnetic Pulses, LEMPs are so powerful they can be detected from as far away as 200 km. They are the footprints that lightning location networks track to locate lightning strikes. If you are

close enough to the strike, these LEMPs can induce very large electric potentials that can destroy electronic equipment and are the principal cause of lightning related power failures on distribution lines. LEMPs from nearby lightning strikes go right through the non-conducting body of nonmetallic tanks and can induce potentials onto metallic components within the tank that can trigger sparking with energies far in excess of the minimum ignition energies of combustible vapors. If the tank contains such combustible vapors in the vicinity of these sparking metallic components, fires become inevitable. Lightning strikes falling within a half-mile or so from nonmetallic tanks represent a serious threat of fire.

LEMPs are also of particular interest for EFRTs and various sources of venting on many other types of tanks including metallic tanks.

Related Item

• FR 116

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Submittal Date: Mon May 07 14:00:11 EDT 2018

Public Comment No. 4-NFPA 780-2018 [Section No. 7.4.5]

7.4.5 ~~Nonmetallic~~ Non-metallic Tanks.

7.4.5.1

Each tank appurtenance with an insulating gasket, ~~such as a thief hatch,~~ including, but not limited to, thief hatches, joints, flanges, and valves, shall be equipped with a flexible bonding conductor across the insulating gasket.

7.4.5.2*

On each tank constructed of nonconductive material, each metallic appurtenance shall be bonded to all other metallic appurtenances with a minimum of main-size Class I conductor.

7.4.5.2.1

Metal bolts on a nonconductive manway shall not be required to be bonded as described in this section.

7.4.5.3*

The bonded ~~mass of~~ appurtenances shall be bonded to ground or to a grounded structure.

7.4.5.4

~~Tanks~~ The grounding system for each tank installed in a multi-tank battery shall be electrically bonded to the grounding systems for all other tanks through Class I main conductors or through ~~connection by~~ connections to electrically ~~contiguous~~ continuous metal walkways.

7.4.5.5

Each tank or tank battery shall be protected with ~~air terminals~~ strike termination devices installed to meet the requirements of Chapter 4.

~~**7.4.5.6** –~~

~~Single main and down conductors and single paths to ground for individual air terminals shall be allowed.~~

~~**7.4.5.7** –~~

~~Bonding jumpers shall be installed across insulating joints, flanges, and valves.~~

~~**7.4.5.8** – Stored Product Bonding.~~

~~**7.4.5.8.1** –~~

~~Each tank containing a flammable liquid or liquid capable of producing flammable vapors or gas shall be equipped with an internal static drain (inductive neutralizer) as described in 8.1.2 of NFPA 77.~~

~~**7.4.5.8.2** –~~

~~The static drain shall be electrically bonded at its upper end to the thief hatch collar or other grounded metal appurtenance or conductor.~~

~~**7.4.5.8.3** –~~

~~The end-to-end electrical resistance of the static drain, including connectors, shall not exceed 1.0 ohm.~~

~~**7.4.5.8.4** –~~

~~The static drain shall be of sufficient length and rigidity that it penetrates the surface of the contained product at all operating fill levels.~~

Statement of Problem and Substantiation for Public Comment

The Flammables Working Group came to a rough consensus on edits to the wording of 7.4.5. The problem (partially) resolved would be the argumentation between members of the TC.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 5-NFPA 780-2018 [New Section after A.7.4.5.2]	

Related Item

• PI-274 and PI-350 as addressed in FR-116

Submitter Information Verification

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Submittal Date: Fri Apr 27 12:55:46 EDT 2018

Public Comment No. 3-NFPA 780-2018 [Section No. 7.4.5.2.1]

7.4.5.2.1

Metal bolts on a nonconductive manway shall ~~not~~ be required to be bonded as described in this section.

Statement of Problem and Substantiation for Public Comment

All metallic components (including hardware & fasteners) on a non-conductive tank / or component must be bonded to ground. This is required in API Standard 650 Annex H and Specification 12P, and the intent is to avoid static discharge.

Related Item

• potential hazard, not LP related

Submitter Information Verification

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Public Comment No. 24-NFPA 780-2018 [Section No. 7.4.5.4]

7.4.5.4

~~Tanks~~ The grounding systems for tanks installed in a multi-tank battery shall be electrically bonded to all other ~~tanks through~~ tank grounding systems using Class I main conductors or through connection by electrically contiguous metal walkways.

Statement of Problem and Substantiation for Public Comment

This clause addresses non-conductive tanks. It does no good to bond non-conductors together.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 29-NFPA 780-2018 [Section No. 7.4.4.2]	

Related Item

• FR-116

Submitter Information Verification

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Submittal Date: Wed May 09 17:02:15 EDT 2018

Public Comment No. 14-NFPA 780-2018 [Section No. 7.4.5.5]

~~7.4.5.5~~ –

~~Each tank or tank battery shall be protected with air terminals installed to meet the requirements of Chapter 4.~~

Statement of Problem and Substantiation for Public Comment

When an air terminal is struck by lightning, a voltage is impressed upon the air terminal that is dependent on the peak current associated with the lightning strike, it's time rate of change, the inductance of the down conductor system and the footing resistance. Side flashes occur whenever the voltage appearing on the down conductor exceeds the breakdown voltage of the gap between the down conductor and some other grounded body.

Similarly, when an air terminal on a fiberglass tank is struck, a voltage will be impressed upon the air terminal. Since these tanks are frequently used in areas of poor soil resistivity, the footing resistance will be high and so will the voltage appearing on the air terminal, in the hundreds of kV or more. Since the tank is made of a thin non-conducting material, from an electrical point of view, the air terminal is effectively suspended in mid-air and thus will produce intense sparking at it's lower end that could go right into the tank. Additionally any metallic components near the tank top, which are bonded to the air terminal, like piping that may enter into the tank, will be exposed to similar voltages and sparking. If there are any combustible vapors within the tank they could be susceptible to ignition from sparking from the air terminal or other metallic components bonded to the air terminal. In this respect the air terminal provides little to no protection against fires, particularly since these tanks typically contain many grounded metallic components at or near the top which can provide the same "protection/hazard" in the absence of an air terminal.

Additionally, the intense magnetic fields generated by the down conductors, when the system is struck by lightning, can induce enormous potentials that can generate hazardous sparking inside the tank. This would also be true for any masts or the down conductors of a catenary system.

The thermal energy associated with a spark of approximately 8" in length is about 0.25mJ. The minimum ignition energy of hydrogen sulfide in air is 0.077mJ (2003) Ignition Handbook. For metallic components installed at the top of a 30ft high tank and using Rusck's Equations for calculating inducing potentials from nearby lightning strikes; for each of the following current levels, the distance from which such a strike can induce potentials sufficient to produce sparking with thermal energy in the 0.25mJ range is given.

3kA -120m, 5kA - 154m, 10kA - 212m, 16kA - 263m

Clearly anything that can provide a protective zone from direct lightning strikes, if struck will be a source of intense fields that can generate hazardous sparking within the tank.

Therefore, air terminals should not be installed on nonmetallic tanks and masts or catenary systems should not be used.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 15-NFPA 780-2018 [Section No. 7.4.5.6]	

Related Item

- FR 116

Submitter Information Verification

Submitter Full Name: amir rizk
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Submittal Date: Mon May 07 13:48:52 EDT 2018

Public Comment No. 15-NFPA 780-2018 [Section No. 7.4.5.6]

~~7.4.5.6~~ –

~~Single main and down conductors and single paths to ground for individual air terminals shall be allowed.~~

Statement of Problem and Substantiation for Public Comment

For reasons cited in my comments on 7.4.5.5, this item should be removed

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 14-NFPA 780-2018 [Section No. 7.4.5.5]	

Related Item

• FR 116

Submitter Information Verification

Submitter Full Name: amir rizk
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Submittal Date: Mon May 07 13:52:57 EDT 2018

Public Comment No. 28-NFPA 780-2018 [Section No. 7.4.5.6]

7.4.5.6

~~Single main and down conductors and single paths to ground for individual air terminals shall be allowed.~~

Statement of Problem and Substantiation for Public Comment

If air terminals are allowed to be used on non-conductive tanks, which they should not, multiple down conductors should be provided to reduce the current density on individual down conductors and reduce the internal electromagnetic fields inside the tank.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 29-NFPA 780-2018 [Section No. 7.4.4.2]	

Related Item

• FR-116

Submitter Information Verification

Submitter Full Name: Mitchell Guthrie
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Submittal Date: Wed May 09 22:07:46 EDT 2018

Public Comment No. 16-NFPA 780-2018 [Section No. 7.4.5.8]

~~**7.4.5.8** – Stored Product Bonding.~~

~~**7.4.5.8.1** –~~

~~Each tank containing a flammable liquid or liquid capable of producing flammable vapors or gas shall be equipped with an internal static drain (inductive neutralizer) as described in 8.1.2 of NFPA 77.~~

~~**7.4.5.8.2** –~~

~~The static drain shall be electrically bonded at its upper end to the thief hatch collar or other grounded metal appurtenance or conductor.~~

~~**7.4.5.8.3** –~~

~~The end-to-end electrical resistance of the static drain, including connectors, shall not exceed 1.0 ohm.~~

~~**7.4.5.8.4** –~~

~~The static drain shall be of sufficient length and rigidity that it penetrates the surface of the contained product at all operating fill levels.~~

Statement of Problem and Substantiation for Public Comment

The term, “bonding” typically refers to the act of providing a secure electrical connection between two conducting bodies. In this case the stored product is either non-conducting or of limited conductivity and so the term, "bonding" is inappropriate. The additional subclauses are addressed individually

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 10-NFPA 780-2018 [Section No. 7.4.5.8.1]	

Related Item

• FR 116

Submitter Information Verification

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Submittal Date: Mon May 07 13:54:48 EDT 2018

Public Comment No. 23-NFPA 780-2018 [Section No. 7.4.5.8]

~~**7.4.5.8** – Stored Product Bonding.~~

~~**7.4.5.8.1** –~~

~~Each tank containing a flammable liquid or liquid capable of producing flammable vapors or gas shall be equipped with an internal static drain (inductive neutralizer) as described in 8.1.2 of NFPA 77.~~

~~**7.4.5.8.2** –~~

~~The static drain shall be electrically bonded at its upper end to the thief hatch collar or other grounded metal appurtenance or conductor.~~

~~**7.4.5.8.3** –~~

~~The end-to-end electrical resistance of the static drain, including connectors, shall not exceed 1.0 ohm.~~

~~**7.4.5.8.4** –~~

~~The static drain shall be of sufficient length and rigidity that it penetrates the surface of the contained product at all operating fill levels.~~

Statement of Problem and Substantiation for Public Comment

Delete the entire Section 7.4.5.8. The section deals with static electricity control, which is outside the scope of NFPA 780. Such requirement belongs in NFPA 77. It is questionable whether the requirements contained in the section would not make the application more susceptible to a lightning threat by maximizing LEMP coupling inside the tank.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 29-NFPA 780-2018 [Section No. 7.4.4.2]	

Related Item

• FR-116

Submitter Information Verification

Submitter Full Name: Mitchell Guthrie
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Submittal Date: Wed May 09 16:45:02 EDT 2018

Public Comment No. 10-NFPA 780-2018 [Section No. 7.4.5.8.1]

7.4.5.8.1

~~Each tank containing a flammable liquid or liquid capable of producing flammable vapors or gas shall be equipped with an internal static drain (inductive neutralizer) as described in 8.1.2 of NFPA 77.~~

Statement of Problem and Substantiation for Public Comment

Inductive neutralizers, as described in NFPA 77 8.1.2 are intended for placement in static electric fields to neutralize static electric charge by ionization of air. The generated ions of opposite polarity to the static charge will move towards the static charge and neutralize them upon contact. Sharp tipped points are particularly useful in this regard because, by virtue of their geometry and ability to concentrate the electric field, they are prone to the production of electric discharges (ions) at the comparatively low and localized electric fields associated with static charges.

However for the same reasons that inductive neutralizers are prone to electric discharges under the low level, localized electric fields associated with static charge, they will also be highly prone to intense and hazardous sparking under the far more powerful and pervasive electric fields associated with lightning strikes and due to their characteristics, they will do so at lower field levels than any other metallic objects within the tank. The sparking from an inductive neutralizer under the influence of the electric fields produced by lightning strikes a half-mile away or more can easily exceed the minimum ignition energy of combustible vapors inside the tank making the presence of an inductive neutralizer inside a non-conducting tank a severe lightning hazard.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 11-NFPA 780-2018 [Section No. 7.4.5.8.2]	
Public Comment No. 12-NFPA 780-2018 [Section No. 7.4.5.8.3]	
Public Comment No. 13-NFPA 780-2018 [Section No. 7.4.5.8.4]	
Public Comment No. 16-NFPA 780-2018 [Section No. 7.4.5.8]	

Related Item

• FR 116

Submitter Information Verification

Submitter Full Name: amir rizk
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Submittal Date: Mon May 07 13:30:25 EDT 2018

Public Comment No. 11-NFPA 780-2018 [Section No. 7.4.5.8.2]

~~7.4.5.8.2~~ –

~~The static drain shall be electrically bonded at its upper end to the thief hatch collar or other grounded metal appurtenance or conductor.~~

Statement of Problem and Substantiation for Public Comment

Bonding an inductive neutralizer to the thief hatch collar or any other metallic component at the tank top, which may be bonded to the air terminal if one is used, is also very hazardous. If the tank is struck, a potential comparable to that impressed upon the air terminal or other bonded components at the tank top will be impressed upon the inductive neutralizer. This could result in the direct application of hundreds of kV or more, which will generate hazardous sparking inside the tank with energies far in excess of the minimum ignition energy of the relevant combustible vapors.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 10-NFPA 780-2018 [Section No. 7.4.5.8.1]	

Related Item

• FR 116

Submitter Information Verification

Submitter Full Name: amir rizk
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Submittal Date: Mon May 07 13:39:05 EDT 2018

Public Comment No. 12-NFPA 780-2018 [Section No. 7.4.5.8.3]

~~7.4.5.8.3~~ –

~~The end-to-end electrical resistance of the static drain, including connectors, shall not exceed 1.0 ohm.~~

Statement of Problem and Substantiation for Public Comment

This item should be deleted for reasons sited in my comments on the previous sub clauses in section 7.4.5.8

Furthermore there appears to be a general misconception among some lightning protection practitioners which may have prompted such recommendations, the belief that the induced image or bound charges on grounded objects due to the free charges in the clouds or descending lightning leader can be removed or bled-off by methods similar to those used to neutralize static charges. This notion is of course incorrect. Induced image charge or bound charge on grounded objects are just that, induced images. Attempting to remove the induced image charges while the inducing free charges remain in place is akin to removing the reflection in a mirror while the object producing the reflection remain in place.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 10-NFPA 780-2018 [Section No. 7.4.5.8.1]	

Related Item

• FR 116

Submitter Information Verification

Submitter Full Name: amir rizk
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Submittal Date: Mon May 07 13:43:00 EDT 2018

Public Comment No. 13-NFPA 780-2018 [Section No. 7.4.5.8.4]

~~7.4.5.8.4~~ –

~~The static drain shall be of sufficient length and rigidity that it penetrates the surface of the contained product at all operating fill levels.~~

Statement of Problem and Substantiation for Public Comment

This item should be deleted for reasons cited in my comments on the previous sub clauses in section 7.4.5.8

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 10-NFPA 780-2018 [Section No. 7.4.5.8.1]	

Related Item

• FR 116

Submitter Information Verification

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Submittal Date: Mon May 07 13:45:51 EDT 2018

Public Comment No. 18-NFPA 780-2018 [Section No. A.1.7]

A.1.7

Keeping the lightning protection system up-to-date with current standards ~~is the best practice. However, periodic inspection and maintenance are often neglected. Facilities that have lightning protection systems older than twenty years, that have undergone additions, or that have had~~ ensures the greatest level of safety. Facilities that have undergone additions alterations should be brought into compliance with the current standards. When a lightning protection system is upgraded, as-built ~~drawings are recommended so the AHJ has a record of the~~ drawings should be revised to document the modifications. These ~~drawing~~ drawings should include ~~testing~~ test point locations ~~, if installed~~ where applicable . Where required by the AHJ, test records of the new configured system should be provided to establish a new baseline for future test measurements. ~~If no modifications have occurred since construction, at a minimum, conduct a visual inspection. Re-evaluate the need to improve the lightning protection system based on the current use and contents of the facility. If the system, as previously installed, provides adequate coverage, no additional changes are required. The AHJ is advised to maintain the applicable drawings and test records. If the system is in disrepair and is no longer deemed necessary by the AHJ based on the structure's use, occupancy, and content, the facility would be better off having the lightning protection system removed than to have a nonfunctional system.~~

Statement of Problem and Substantiation for Public Comment

The proposed revision, as written, infers too much responsibility on the AHJ. For example, very few AHJs maintains drawings or test records. These should be maintained locally at the site so they can be used. The suggestions in the text should be applicable regardless of whether an AHJ is involved. Much of this text is more applicable to Annex D.
The annex material adds new recommendations not consistent with the normative text of the referenced clause and may not be necessary for all applications. It infers that acceptable grandfather clauses should not be implemented.

Related Item

• FR-75

Submitter Information Verification

Submitter Full Name: Mitchell Guthrie
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City:
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Submittal Date: Wed May 09 10:15:35 EDT 2018

Public Comment No. 8-NFPA 780-2018 [Section No. A.4.14.4]

A.4.14.4 —

~~Corrugated stainless steel tubing (CSST) can be used in a gas piping system. CSST should be bonded to the lightning protection system as much as possible to lower the probability of arcing. The CSST should be bonded as close to the gas service entrance as possible, at any appliance supplied by the CSST, and at any manifold present in the gas piping system. In addition, the length of any bonding conductor between the CSST gas piping system and the lightning protection grounding system should be as short as possible.~~

~~Shorter bonding lengths might limit the voltage drop between CSST and other metal components, thereby lowering the probability of the development of an electric arc. The shorter bonding length might conduct a larger amount of current to ground and might reduce voltage differences on the CSST.~~

~~No protective measures exist that can assure lightning protection of a CSST system installed in a facility.~~

—

Delete proposed annex material in its entirety and replace with Attachment with revised Annex material.

Additional Proposed Changes

File Name	Description	Approved
Public_Comment_to_NFPA-780-FR_49-Torbin.docx	Public Input NFPA 780 Annex-Torbin	

Statement of Problem and Substantiation for Public Comment

The annex text is revised to make lightning protection system installers aware that NFPA 54 allows many different gas piping materials affected by the requirements of Section 4.14.4 including CSST. Any interior metallic gas piping system should be bonding to the LPS grounding system regardless of whether the underground service piping is metallic or not. NFPA 780 strives to achieve equal potential between all metallic pathways to ground within the building in order to eliminate the potential for arcing. The NFPA Standards Council has determined that the bonding requirements for interior gas piping systems for both household electrical service faults and for lightning strikes are within the scope of the NFPA 54 Technical Committee. The Gas Technology Institute conducted research on the effectiveness of bonding CSST systems under lightning conditions, and published a report to the NFPA 54 Technical Committee. The recommendation for multiple bonding connections is revised to recognize that only a single point of attachment is required by NFPA 54, and it could be anywhere within the piping system. As proposed, the requirement for multiple bonding connections is not technically substantiated, and would be mandated regardless of the length/arrangement of the piping system, the location of the gas appliances and manifold(s), and the proximity to the grounding system. While multiple bonding connections are not prohibited, the LPS installer must make a justifiable determination for extra bonding on a case-by-case basis. The requirement for locating the bonding conductor at the service entrance is no longer an imperative given that essentially all underground service lines for fuel gas are now polyethylene construction.

The recommendation that all bonding conductors be “as short as possible” is changed to “as short as practical” because installers need some flexibility in routing bonding conductors so that is not susceptible to damage and can meet the 75-ft requirement within NFPA 54.

The last sentence has been modified to recognize that any metallic piping material/system can be damaged by a direct lightning strike, as this section of the code is not gas or material specific.

Related Item

• Public Input 154

Submitter Information Verification

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Submittal Date:	Thu May 03 21:06:20 EDT 2018

Delete proposed Annex material (A.4.14.4) in its entirety and replace with the following:

Corrugated stainless steel tubing (CSST) is one of many gas piping materials allowed by NFPA 54 (National Fuel Gas Code) that can be affected by Section 4.14.4. Where a lightning protection system (LPS) is installed on a building containing fuel gas piping, the piping system should be bonded to the lightning protection system to lower the probability of arcing from a direct strike. NFPA 54 includes specific electrical bonding requirements to minimize damage to the CSST by lightning strikes:

1. The CSST system must be bonded at one location in accordance with the requirements of NFPA 54 (Section 7.12.2). This location may be on the customer's gas piping near the service entrance, near a gas appliance with a metallic vent installed through the roof and/or above the roofline, or at any manifold present in the gas piping system.
2. The bonding clamp must never be mounted directly on the CSST or its jacket.
3. The length of any bonding conductor between the CSST gas piping system and the LPS grounding system should be as short as practical, but in no case longer than 75-ft (22.86-m) in accordance with the National Fuel Gas Code (7.12.2).
4. The installation of additional bonding clamps and conductors at multiple locations are not required unless the installing LPS contractor determines the need for extra connections for a given building and gas piping system.

Shorter lengths for the bonding conductor will help minimize the voltage differential between the gas piping and other nearby metal components, and, thereby lowering the probability that an electric arc will be initiated or damage incurred to the piping system.

No protective measures exist that can assure protection of any metallic piping system installed in a building from damage due to lightning.

Public Comment No. 5-NFPA 780-2018 [New Section after A.7.4.5.2]

A.7.4.5.3

Bonding of the contained product to grounded metal tank components should be considered. If not equalized, the charge on the product may arc to another mass at a different potential during a direct or nearby lightning strike. One technique may be to install a conductive appliance with low electrical resistance inside the tank, suspended from and electrically bonded to the thief hatch collar and extending to the bottom of the tank, penetrating the surface of the product at all fill levels. This will not equalize charge in all areas of the product, but can serve to equalize charge local to the appliance.

Statement of Problem and Substantiation for Public Comment

Wording submitted is in support of the Flammables Working Group edits to 7.4.5.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 4-NFPA 780-2018 [Section No. 7.4.5]	Tight. Like, bros, dude. They hang out on the reg.

Related Item

• PI-274 and PI-350, as addressed in FR-116.

Submitter Information Verification

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Submittal Date: Fri Apr 27 13:16:54 EDT 2018

Public Comment No. 19-NFPA 780-2018 [Section No. A.11.4.4.1]

A.11.4.4.1

To maintain all counterpoise conductors at the same potential, all counterpoise conductors should be bonded at all crossings and intersections. Crossing counterpoise conductors could be at different elevations. All counterpoise conductors within 5 ft (1.5 m) of each other should be bonded. The actual safe separation distance in soil is dependent upon the local earth resistivity. The higher the earth resistivity, the greater the breakdown distance of the soil. Every reasonable and prudent means should be utilized to locate all intersecting or crossing counterpoise conductors.

Statement of Problem and Substantiation for Public Comment

The proposal highlights the well documented relationship between soil breakdown distance (or minimum separation distance) and earth resistivity but does not change the recommended value.

Related Item

• FR-61

Submitter Information Verification

Submitter Full Name: Mitchell Guthrie
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Street Address:
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Submittal Date: Wed May 09 12:15:05 EDT 2018

Public Comment No. 9-NFPA 780-2018 [Section No. F.2.1]

F.2.1 Conductors.

Conductors should conform to the requirements of Chapter 4 for bonding conductors.

Conductors should conform to the requirements of Chapter 4 for **main** conductors.

Statement of Problem and Substantiation for Public Comment

Changes proposed by the Tree Care Industry and accepted by the NFPA for the 2014 edition of NFPA-780 appear to have been proposed for the purpose of harmonization of the NFPA Standard and the ANSI A300 Standard. While harmonization between standards is important, it seems the process of harmonizing did not fully consider the effects that changing the standard could have. It would seem that a proposal to drastically diminish the size and quantity of the cable(s) required to protect trees (and adjacent protected buildings, as stated in Paragraph F.1) from two (Class II, where applicable, or Class I) main conductor cable(s) to one tiny bonding conductor would raise eyebrows since it is completely inconsistent with all other requirements of NFPA-780. I understand that the Annex sections are "...for informational purposes only" but it seems there should be some relative consistency. Further, if two (minimum) Class II main conductors are required to conduct lightning for 76 feet to ground on a building, why would a single, tiny bonding conductor serve the same purpose on a 150 foot tree?
In 2014, too late for proposing changes in the 2017 edition of NFPA-780, I submitted a letter to the Technical Committee expressing my concerns and included documentation of a witness to the failures of the research that the changes were based on. It is my hope that Annex F will revert back to pre-2014 editions of NFPA-780, including the need for two down conductors on trees over three feet in diameter.

Related Item

• PI 354-NFPA 780-2017

Submitter Information Verification

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Submittal Date: Sun May 06 22:35:14 EDT 2018

Public Comment No. 21-NFPA 780-2018 [New Section after F.2.5]

Annex G: Protection for Bridges

G.1 General. **This annex provides guidance for the protection of bridges from lightning damage.**

G.1.1 **The guidelines in this annex should apply to the following types of structure:**

(1) Beam bridges

(2) Arch bridges

(3) Cantilever bridges

(4) Cable stayed bridges

(5) Suspension bridges

(6) Truss bridges

G.1.2 **All of the requirements of Chapter 4 should apply, except as modified by this chapter.**

G.1.3 **Piers, in this chapter, refers to a supporting tower for a bridge structure, as found in cable stayed and suspension bridges.**

G.2 Protection for Bridges

G.2.1 **Where required by construction, down conductors and grounding electrodes should be permitted to be spaced at greater than the 100 foot (30 m) average required by 4.9.10.**

G.2.2 **Grounding electrodes should be placed at each end of the bridge, and at each pier, where such are present.**

G.2.3 **Bridges should be provided with deck–level potential equalization networks consisting of interconnected cables and/or conductors running along these structures to provide interconnection of all permanently installed metal objects on the bridge.**

G.2.4 **Where expansion joints are installed on a bridge, adequate jumpers should be provided such that the lightning protection will not be damaged by thermal movement of the bridge components.**

G.2.5 **Strike termination devices should be provided to protect all appurtenances that extend outside the zone of protection, including aircraft hazard lights, antennas, railings, etc.**

G.2.4 Beam and Cantilever bridges.

G.2.4.1 **Consideration should be given to protecting beam and cantilever bridges with elevated strike termination devices on poles or light standards.**

G.2.4.2 **Handrails and/or guardrails should be permitted to serve as strike termination devices, subject to the requirements of section 4.7.**

G.2.5 Arch bridges.

G.2.5.1 **Where the supporting arch is of any material other than structural metal that meets the requirements of section 4.19, strike termination devices should be provided.**

G.2.6 Cable stayed bridges.

G.2.6.1 **Where the supporting piers are of any material other than structural metal that meets the requirements of 4.19, strike termination devices should be provided.**

G.2.6.2 **Strike termination devices should not be required on the uppermost cable stay where their provision would interfere with the operation or maintenance of the bridge.**

G.2.6.3 **The cable stays and their anchoring boxes should be grounded at their top and bottom extremities to the down conductors and deck-level potential equalization network.**

G.2.6.4 **Intermediate equipotential loops shall be provided for the pier(s) in accordance with section 4.15.**

G.2.7 Suspension bridges.

G.2.7.1 **Suspension bridges should be protected in the same manner as cable stayed bridges.**

G.2.8 Truss bridges.

G.2.8.1 **Where the trusses are constructed of any material other than structural metal that meets the requirements of section 4.19, strike termination devices should be provided for the top chord.**

G.3 Surge protection.

G.3.1 **Surge protection devices should be installed for all electrical power and communications**

systems on the bridge, in accordance with the requirements of section 4.20.

G.3.2 **The deck-level potential equalization network should be permitted to serve as the supplementary ground reference point for SPDs protecting communications systems.**

Statement of Problem and Substantiation for Public Comment

There is currently no guidance for protection of bridges from lightning. This remedies the situation by providing annex material to that end.

Related Item

• PI-328

Submitter Information Verification

Submitter Full Name: Simon Larter
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Submittal Date: Wed May 09 15:51:28 EDT 2018

Public Comment No. 32-NFPA 780-2018 [Section No. M.2.1]

M.2.1

Most lightning strike victims are struck before or after the rain that usually accompanies thunderstorms. This would indicate that most people have the good sense to get out of the rain, but are not as conscious of the life-threatening hazards presented by lightning. Atmospheric conditions that cause lightning can be measured and the probability of a lightning event predicted. However, it is not possible to predict the exact location where lightning will strike since it has been known to attach to earth beyond the visible horizon.

Lightning is extremely dangerous, and unnecessary exposure should be avoided. The following recommendations are advisable:

(1) When possible, plan outdoor activities around the weather forecast. Although it is difficult to know exactly if a storm will occur, the conditions that create lightning storms, such as the meeting of high- and low-pressure systems, are predicted days in advance. On days when such weather patterns are forecast, avoid planning activities where shelter is not readily available, such as boating or camping.

(2) Check the forecast the night before and the morning of planned outdoor activities to see if lightning is a possibility.

(3) Check weather maps online before you leave. Most weather websites will have recent satellite and radar images of the area of your activity.

(4) When you arrive at the area of your activity, devise a plan on where to go in the event of an approaching lightning storm. Tell all persons in your party, especially children, where to go in accordance with M.2.2. Also, tell your party where you will meet ~~half an hour~~ 30 minutes after thunder is last heard, since you may not be together when the threat of a storm arises.

(5) Carry a weather radio with an “Alert” feature or set your mobile device to receive severe weather warnings.

(6) Respond accordingly when warnings are issued.

Statement of Problem and Substantiation for Public Comment

Most personal safety safety documents require 30 minutes as the waiting time since the the last lightning strike or when thunder has occurred before resuming operations. Thirty minutes should be used here.

Related Item

• PI-63

Submitter Information Verification

Submitter Full Name: Mitchell Guthrie
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Street Address:
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Submittal Date: Wed May 09 23:52:21 EDT 2018

Public Comment No. 33-NFPA 780-2018 [Section No. M.2.2 [Excluding any Sub-Sections]]

If you hear thunder, seek shelter immediately. Do not try to predict how close lightning is by counting the time between the flash of lightning and the sound of thunder. Seek shelter in one of the following structures, and remain there until ~~half an hour~~ 30 minutes after you last hear thunder:

(1) A dwelling or other building that is protected against lightning

(2) A large metal-framed building

(3) An enclosed automobile, bus, or other vehicle with a metal top and body

(4) An enclosed metal train or street car

Statement of Problem and Substantiation for Public Comment

30 minutes is the term used most often in personnel safety rules

Related Item

• FR-67

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