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Agenda NFPA Technical Committee on Lightning Protection NFPA 780 Second Draft Meeting (A2025)

Microsoft Teams Meeting
November 18 – 19, 2024

Virtual Meeting
To join the meeting, please contact scaldwell@nfpa.org

- 1. Call to order.** Christine Porter, Chair.
- 2. Introductions.** See Committee Roster attached.
- 3. Chair report.** Christine Porter.
- 4. Previous meeting minutes.** October 2023.
- 5. Staff Liaison report.** Chris Coache.
- 6. NFPA 780 Second Draft.**
 - a. Public Comments.** See attached.
- 7. Other business.**
- 8. Adjournment.**

Address List No Phone

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Lightning Protection

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Michael J. Ventola	M 08/29/2024	Christopher Coache	4/12/2017
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National Electrical Manufacturers Association			
Principal: Bryan P. Holland			



NATIONAL FIRE PROTECTION ASSOCIATION

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PRELIMINARY MINUTES

NFPA Technical Committee on Lightning Protection (LIG-AAA) NFPA 780 First Draft Meeting (A2025)

October 25-27, 2023
10:00 am – 6:00 pm (Eastern)

Virtual Meeting

1. **Call to order.** Christine Porter, chair, called the meeting to order at 10:05 on October 25, 2023.
2. **Introductions.** Attendees introduced themselves and identified their affiliation and NFPA staff took attendance.
3. **Chair report.** Christine Porter welcomed attendees and provided an overview of the meeting.
4. **Staff liaison report.** Christopher Coache provided an overview of the standards development process and the revision cycle schedule.
5. **Technical Committee Representation.** There were no declarations of representing another company, organization, or interest category.
6. **Previous meeting minutes.** The minutes from October 21 - 23, 2021 virtual meeting were approved without revision.
7. **NFPA 855 First Draft.**
 - a. **Review of Public Inputs.** The Technical Committee reviewed the public inputs and developed first revisions and committee inputs as necessary. These will be available in the First Draft Report at www.nfpa.org/780.
 - b. **Task group report(s).** The following task groups provided their reports and recommendations.
 - i. **TG 1 Definitions.** TG Chair: Ernie Gallo. The task group provided a report on public inputs and proposed resolution or first revision as applicable. The task group has been discharged with thanks.
 - ii. **TG 2 Surge Protection.** TG Chair: Bryan Holland. The task group provided a report on public inputs and proposed resolution or first revision as applicable. The task group has been discharged with thanks.
 - iii. **TG 3 Miscellaneous Public Inputs.** TG Chair: Mark Morgan. The task group provided a report on public inputs and proposed resolution or first revision as applicable. The task group has been discharged with thanks.

- iv. **TG 4 Chapter 4.** TG Chair: John Tobias. The task group provided a report on public inputs and proposed resolution or first revision as applicable. The task group has been discharged with thanks.
 - v. **TG 5 Copper Clad Steel.** TG Chair: Bryan Holland. The task group provided a report on public inputs and proposed resolution or first revision as applicable. The task group has been discharged with thanks.
 - vi. **TG 6 Annexes.** TG Chair: Mitch Guthrie. The task group provided a report on public inputs and proposed resolution or first revision as applicable. The task group has been discharged with thanks.
 - vii. **TG 7 Chapter 7.** TG Chair: David Gerstetter. The task group provided a report on public inputs and proposed resolution or first revision as applicable. The task group has been discharged with thanks.
 - viii. **TG 8 Chapter 8.** TG Chair: Chris Batchelor. The task group provided a report on public inputs and proposed resolution or first revision as applicable. The task group has been discharged with thanks.
 - ix. **TG 9 Annex N.** TG Chair: David Gerstetter. The task group provided a report on public inputs and proposed resolution or first revision as applicable. The task group has been discharged with thanks.
 - x. **TG 10 Watercraft – Nonmetallic Masts.** TG Chair: Ewen Thomson. The task group provided a report on public inputs and proposed resolution or first revision as applicable. The task group was reconstituted to continue work.
 - xi. **TG 11 Watercraft – Zone of Protection.** TG Chair: Ewen Thomson. The task group provided a report on public inputs and proposed resolution or first revision as applicable. The task group was reconstituted to continue work.
- c. **Presentation(s).** The committee heard presentations from the following individuals.
- i. **Copper Clad Steel Conductors.** Peter Graser. Five minutes.
 - ii. **Annex N.** Amir Rizk. Five minutes. Presentation attached.
- d. **New task groups.** The following task groups were appointed to work subsequent to the meeting. Additional task groups may be formed based on submitted public comments.
- i. **TG 12 Effect of Inducing Potentials.** TG Chair: John Tobias. Members: Seeking members. Evaluate effects of LEMP on structures.
 - ii. **TG 13 Use of Terms (combustible/flammable).** TG Chair: David Gerstetter. Members: [names]. Review use of combustible/flammable for consistency throughout standard. Investigate structures that produce but do not contain flammable materials.
 - iii. **TG 14 Use of Piles.** TG Chair: Simon Larter. Members: Carl Johnson. Determine the applicability of piles as grounding medium.
 - iv. **TG 15 Class III Materials.** TG Chair: Bruce Kaiser. Members: Seeking members. Evaluate the use of Class III materials for lightning protection systems.

- v. **TG 16 Chapter 4 Correlation.** TG Chair: John Tobias. Members: Andy McElroy. Review Chapter 4 requirements for correlation throughout standard.
- vi. **TG 17 Strike Termination Bracing.** TG Chair: Sam Barrack. Members: Seeking members. Evaluate side bracing requirements for strike termination devices.
- vii. **TG 19 Copper Clad Steel.** TG Chair: Mitch Guthrie. Members: Carl Johnson, Peter Graser (Copperweld), Andy McElroy. Review the use of Copper Clad Steel with lightning protection systems and address concerns with viability and potential damages of CCS using connectors and fittings listed for use with lightning protection systems.
- viii. **TG 20 Inspection and Maintenance (Chapter 1).** TG Chair: Bryan Holland. Members: Carl Johnson, Andy McElroy, Simon Larter. Recommend inspection and maintenance criteria for inclusion in standard.

8. Other Business. None.

9. Future meetings. The next committee meeting will be [date range]. Proposed location if the meeting is onsite is Ashville, North Carolina. A meeting notification will be posted at www.nfpa.org/780next when the next meeting is scheduled. Public Comments for the next edition are expected to close May 2024.

10. Adjournment. The meeting was adjourned at 4:25 pm on October 27, 2023.

Attendees

Committee Members:

✓	Porter, Christine	Chair	Intertek Testing Services
✓	Ashton, Daniel	Principal	Lumen Technologies, Inc./Centurylink
✓	Barrack, Samuel	Principal	Consolidated Nuclear Security, LLC
✓	Batchelor, Christopher	Principal	US Department of the Navy
	Caie, Matthew	Principal	nVent/Pentair/ERICO, Inc.
✓	Campbell, Joanie	Principal	US Department of the Air Force
	Covino, Josephine	Principal	US Department of Defense
✓	Friend, Kenneth	Principal	Jasper Thompson Lightning Protection,
✓	Gerstetter, David	Principal	UL Solutions
✓	Graves, Chuck	Principal	US Federal Aviation Administration
✓	Guthrie, Mitchell	Principal	Engineering Consultant
	Harger, Mark	Principal	Harger Lightning & Grounding
✓	Harger, Timothy	Principal	Lightning Protection Institute
	Heary, William	Principal	Heary Brothers Lightning Protection
✓	Hoffman, Joshua	Principal	Institute of Makers of Explosives (IME)

✓	Holland, Bryan	Principal	National Electrical Manufacturers
✓	Humeniuk, Stephen	Principal	United Lightning Protection Association,
✓	Johnson, Carl	Principal	AVCON, Inc.
✓	Kaiser, Bruce	Principal	Lightning Master Corporation
✓	Larter, Simon	Principal	Dobbyn Lightning Protection
✓	McAfee, David	Principal	Lightning & Fire Protection Consultant
✓	McKinch, Terrance	Principal	Signal Energy Constructors
	Melton, Robley	Principal	Alliance for Telecommunications Industry
✓	Morgan, Mark	Principal	East Coast Lightning Equipment, Inc.
✓	Pettross, Luke	Principal	Lightning Eliminators & Consultants Inc.
	Rapp, Robert	Principal	National Lightning Protection Corporation
✓	Santis, Lon	Principal	Explosives Risk Managers, LLC
✓	Thomson, Ewen	Principal	Marine Lightning Protection Inc.
✓	Tobias, John	Principal	US Department of the Army
	Steffes, Allan	Voting Alternate	Thompson Lightning Protection Inc.
	Tietjen, Leah	Voting Alternate	Los Alamos National Laboratory
✓	Bas, Luis	Alternate	Intertek Testing Services
✓	Boettcher, Eric	Alternate	UL Solutions
✓	Gallo, Ernest	Alternate	Alliance for Telecommunications Industry
	Heary, Kenneth	Alternate	Heary Brothers Lightning Protection
	Lanzoni, Joseph	Alternate	Lightning Eliminators & Consultants Inc.
✓	McElroy, Andrew	Alternate	Harger Lightning & Grounding
	Morgan, Jennifer	Alternate	East Coast Lightning Equipment
✓	Portfleet, George	Alternate	United Lightning Protection Association,
✓	Svendsen, Paul	Alternate	National Lightning Protection Corporation

Guests:

- ✓ Amir Rizk Lightning Electrotechnologies Inc.
- ✓ Peter Graser Copperweld
- ✓ Brian Ellis Hubbell

✓ Participated by teleconference

Total number in attendance: 32

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
3.3.12	44	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	3.3.12 Explosives Explosive Materials. Materials, including explosives, blasting agents, and detonators, that are authorized for transportation by the Department of Transportation or the Department of Defense as explosive materials.		
First Revision Text (FR)			
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	The wording as currently given is in line with military standards.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
3.3.13	45	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	3.3.13 Fastener. An attachment device used to secure the conductor <u>and/or fitting</u> to the structure.		
First Revision Text (FR)			
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	The proposed definition for a fastener would be in conflict with Section 4.9.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
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A.3.3.24	46	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	A.3.3.24 Light Base. The light base is cylindrically shaped with a closed bottom and a top flange to mate with an airfield fixture or cover. Currently available light bases have provisions for cable or conduit entry and exit and provisions for bonding. Type L-867 light bases and extensions are used for applications subject to occasional light vehicular loading but no aircraft or other heavy vehicular loading. Type L-868 light bases and extensions are used for applications subject to aircraft and other heavy vehicular loading. Light bases, which can be fabricated from metallic or nonmetallic materials, serve as a connection point for the raceway and housing for mounting the light fixture. Light bases are subject to direct earth burial with or without concrete backfill. Drain connections, load rings, and other options are available for the light base. Additional information can be found in FAA Advisory Circular 150/5345-42J, 42K, <i>Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories</i>.		
First Revision Text (FR)	A.3.3.24 Light Base. The light base is cylindrically shaped with a closed bottom and a top flange to mate with an airfield fixture or cover. Currently available light bases have provisions for cable or conduit entry and exit and provisions for bonding. Type L-867 light bases and extensions are used for applications subject to occasional light vehicular loading but no aircraft or other heavy vehicular loading. Type L-868 light bases and extensions are used for applications subject to aircraft and other heavy vehicular loading. Light bases, which can be fabricated from metallic or nonmetallic materials, serve as a connection point for the raceway and housing for mounting the light fixture. Light bases are subject to direct earth burial with or without concrete backfill. Drain connections, load rings, and other options are available for the light base. Additional information can be found in FAA Advisory Circular 150/5345-42JK, <i>Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories</i>.		
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	This change notes the latest FAA Advisory Circular.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
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3.3.48	47	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	3.3.48 Turf. Grass, stabilized soil, asphalt , or any other hard -treated surface not intended as a paved shoulder, installed from the edge of the runway or taxiway full strength pavement to just outside the airfield lighting circuits.		
First Revision Text (FR)	3.3.48 Turf <u>Shoulder</u> . Grass, stabilized soil, asphalt , or any other hard - <u>treated</u> surface not intended as a paved shoulder, installed from the edge of the runway or taxiway full strength pavement to just outside the airfield lighting circuits.		
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	The revised definition provides clarity.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New definition	43	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	Fitting. An accessory such as an air terminal base, cable support, bushing, or other part of a lightning protection system that is intended primarily to perform a mechanical rather than an electrical function.		
First Revision Text (FR)			
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	The proposed definition does not address all the possible applications for a fitting.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New definition	36	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	Insulating Down Conductor Conductor provided with a layer of insulation for use in an electrically insulated lightning protection system with the purpose of providing an equivalent separation distance.		
First Revision Text (FR)			
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	This definition does not exist in the latest draft of IEC 62305-3. Insulating down-conductors refers to a specific device described in IEC TR 62561-8. The existing IEC Committee Document (CD) scope calls out insulating stand-offs and insulating down-conductors. The CD does not include the proposed definition.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New definition	39	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	Electrically Insulated Lightning Protection System A lightning protection system with a insulated mast strike-termination system and insulated-conductor system attached to the structure but positioned in such a way that it has no electrical contact with the structure to be protected except at ground level for equipotential bonding and that provides an equivalent separation distance comparable to the bonding calculation.		
First Revision Text (FR)			
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	This definition does not exist in the latest draft of IEC 62305-3. Insulating down-conductors refers to a specific device described in IEC TR 62561-8. The existing IEC Committee Document (CD) scope calls out insulating stand-offs and insulating down-conductors. The CD does not include the proposed definition.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New definition	38	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	Isolated Lightning Protection System. A lightning protection system positioned in such a way that it has neither electrical nor physical contact with the structure to be protected except at ground level for equipotential bonding.		
First Revision Text (FR)			
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	This definition does not exist in the latest draft of IEC 62305-3. Insulating down-conductors refers to a specific device described in IEC TR 62561-8. Definitions are provided for catenary and mast-type lightning protection systems. The existing IEC Committee Document (CD) scope calls out insulating stand-offs and insulating down-conductors. The CD does not include the proposed definition.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New definition	145	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	Mast. A slender, vertical structure.		
First Revision Text (FR)			
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	Masts described in this standard are much more than slender objects and is well described in the text. There is no need to define mast when NFPA 780 already have mast-type lightning protection systems defined,		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
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New definition	108	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	Separation Distance Necessary distance between a conductor carrying partial lightning current and other conductive parts to avoid dangerous sideflash.		
First Revision Text (FR)			
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	The term used in NFPA 780 is sideflash and this new definition could cause confusion.		

3.3.45	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
	144		☒ Create First Revision ☐ Resolve
Proposed Text (PI)			
First Revision Text (FR)	3.3.45 * -Surge-Protective Device (SPD). A protective device for limiting the transient voltages by diverting or limiting the surge current and preventing the continued flow of the follow current while remaining capable of repeating these functions.		
Statement (technical reason for FR)	This revision makes the definition more clear and concise.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
	<u>Committee FR</u>		☒ Create First Revision ☐ Resolve

Proposed Text (PI)	3.3.5 Catenary Lightning Protection System. A lightning protection system consisting of one or more overhead ground wires <u>not attached to the structure.</u>
First Revision Text (FR)	3.3.5 Catenary Lightning Protection System. A lightning protection system consisting of one or more overhead ground wires <u>not attached to the structure.</u>
Statement (technical reason for FR)	Overhead ground wires stretched between higher parts of a structure to provide a zone of protection for a lower roof is not a catenary lightning protection system per this standard.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
3.3.45	144	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	3.3.45* Surge-Protective Device (SPD). A protective device for limiting the transient voltages by diverting or limiting the surge current and preventing the continued flow of the follow current while remaining capable of repeating these functions.		
First Revision Text (FR)	3.3.45* Surge-Protective Device (SPD). A protective device for limiting the transient voltages by diverting or limiting the surge current and preventing the continued flow of the follow current while remaining capable of repeating these functions.		
Statement (technical reason for FR)	This makes the definition clearer and more concise.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
A.4.19.2.4	106	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	A.4.19.2.4 The requirements of 4.19.2.4 is not intended to restrict the owner or LPS designer/installer from specifying or installing SPDs when they determine it to be of benefit. Most services to facilities require discrete surge suppression devices to protect against damaging surges. Occasionally, services might be located in an area or manner for which the threat from lightning-induced surges and overvoltage transients is negligible. For example, the requirement in 4.19.2.2(see also A..19.4.2) exempts services less than 100 ft (30 m) in length that are run in grounded metal conduit between buildings requiring surge protection. Other examples where SPDs might not be required at each service entrance are those applications for which fiber optic transmission lines (with no conducting members) are used. The standard recognizes that there might be some exceptions. Consequently, the standard allows for such exceptions to the requirements for surge suppression on electrical utility, data, and other signal lines provided a competent engineering authority determines that the threat is negligible or that the system is protected in a manner equivalent to surge suppression protection. The allowance in this standard for the exemption of surge suppression protection at specific locations is not intended to provide a broad exemption simply because surge suppression equipment might be inconvenient to install. Rather, this allowance recognizes that all possible		

	circumstances and configurations, particularly those in specialized industries, cannot be covered by this standard. Determinations made by an engineering authority for exempting the installation of SPDs should focus on the likelihood of lightning activity in a region, the level of damage that might be incurred, and the potential loss of human life or essential services due to inadequate overvoltage protection. The following four methods of analysis are commonly used for this determination, although other equivalent analysis can be used: (1) <i>A risk assessment</i> can be performed in accordance with IEC 62305-2, <i>Protection Against Lightning — Part 2: Risk Management</i>, and surge protection requirements can be waived if justified by the assessment. (2) <i>A lightning flash density/risk analysis</i> can be performed to determine the frequency of lightning activity in the geographic area of a facility. As a rule of thumb, if the flash density exceeds one flash per square kilometer per year, surge suppression or other physical protection should be considered. Lightning energy can indirectly couple to services at ranges greater than 0.6 mi (1 km) to create potentially damaging overvoltage. (3) <i>Plant/facility statistical or maintenance records</i> can be used for risk analysis, if they demonstrate the lack of damage on a service caused by surges, as well as to justify low risk of surge damage in particular systems or facilities. (4) <i>A lightning electromagnetic environment analysis</i> can take the threat of an electromagnetic field from a nearby lightning strike and compute the magnitude and rise-time characteristics of transients coupled into services feeding a structure or facility. Based on the computed threat, SPDs can be sized appropriately or omitted, as warranted. This analysis is typically performed in critical communications facilities and for military applications. Electromagnetic environments for such an analysis can be found in MIL-STD-464C, <i>Interface Standard Electromagnetic Environmental Effects Requirements for Systems</i>, and IEC 62305-4, <i>Protection Against Lightning — Part 4: Electrical and Electronic Systems Within Structures</i>. In all cases, the criticality of continued operation, potential hazard to persons and essential services, and consequences of facility damage or shutdown should be considered. If a hazardous condition results from a surge causing temporary shutdown without permanent damage (e.g., due to the disabling of a computer or communication system), then the requirements for surge suppression as articulated by Section 4.19 should not be exempted.
First Revision Text (FR)	A.4.19.2.4 <u>Section 4.19.2.4 is not intended to restrict the owner or LPS designer/installer from specifying or installing SPDs when they determine it to be of benefit.</u> Most services to facilities require discrete surge suppression devices to protect against damaging surges. Occasionally, services might be located in an area or manner for which the threat from lightning-induced surges and overvoltage transients is negligible. For example, the requirement in 4.19.2.2(see also A.4.19.4.2) exempts services less than 100 ft (30 m) in length that are run in grounded metal conduit between buildings requiring surge protection. Other examples where SPDs might not be required at each service entrance are those applications for which fiber optic transmission lines (with no conducting members) are used. The standard recognizes that there might be some exceptions. Consequently, the standard allows for such exceptions to the requirements for surge suppression on electrical utility, data, and other signal lines provided a competent engineering authority determines that the threat is

negligible or that the system is protected in a manner equivalent to surge suppression protection.

The allowance in this standard for the exemption of surge suppression protection at specific locations is not intended to provide a broad exemption simply because surge suppression equipment might be inconvenient to install. Rather, this allowance recognizes that all possible circumstances and configurations, particularly those in specialized industries, cannot be covered by this standard.

Determinations made by an engineering authority for exempting the installation of SPDs should focus on the likelihood of lightning activity in a region, the level of damage that might be incurred, and the potential loss of human life or essential services due to inadequate overvoltage protection.

The following four methods of analysis are commonly used for this determination, although other equivalent analysis can be used:

1. A *risk assessment* can be performed in accordance with IEC 62305-2, *Protection Against Lightning — Part 2: Risk Management*, and surge protection requirements can be waived if justified by the assessment.
2. A *lightning flash density/risk analysis* can be performed to determine the frequency of lightning activity in the geographic area of a facility. As a rule of thumb, if the flash density exceeds one flash per square kilometer per year, surge suppression or other physical protection should be considered. Lightning energy can indirectly couple to services at ranges greater than 0.6 mi (1 km) to create potentially damaging overvoltage.
3. *Plant/facility statistical or maintenance records* can be used for risk analysis, if they demonstrate the lack of damage on a service caused by surges, as well as to justify low risk of surge damage in particular systems or facilities.
4. A *lightning electromagnetic environment analysis* can take the threat of an electromagnetic field from a nearby lightning strike and compute the magnitude and rise-time characteristics of transients coupled into services feeding a structure or facility. Based on the computed threat, SPDs can be sized appropriately or omitted, as warranted. This analysis is typically performed in critical communications facilities and for military applications. Electromagnetic environments for such an analysis can be found in MIL-STD-464C, *Interface Standard Electromagnetic Environmental Effects Requirements for Systems*, and IEC 62305-4, *Protection Against Lightning — Part 4: Electrical and Electronic Systems Within Structures*.

In all cases, the criticality of continued operation, potential hazard to persons and essential services, and consequences of facility damage or shutdown should be considered. If a hazardous condition results from a surge causing temporary shutdown without permanent damage (e.g., due to the disabling of a computer or

	communication system), then the requirements for surge suppression as articulated by Section 4.19 should not be exempted.
Statement (technical reason for FR)	This clarifies that SPDs are not prohibited from being installed.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.19.2.11	82	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	4.19.2.11 SPDs shall be made inaccessible to unqualified persons unless the SPDs are listed for installation in accessible locations.		
First Revision Text (FR)	4.19.2.11 SPDs shall be made inaccessible to unqualified persons unless the SPDs are listed for installation in accessible locations.		
Statement (technical reason for FR)	This deletes the section as the listing of an SPD per UL 1449 does not include certification for installation in accessible locations.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.19.2.12.1	83	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	4.19.2.12.1 A surge-protective device SPDs shall be permitted to be connected between any two conductors — ungrounded conductors, grounded conductors, equipment grounded grounding conductors, or grounding electrode conductors.		

First Revision Text (FR)	4.19.2.12.1 A surge-protective device <u>SPDs</u> shall be permitted to be connected between any two conductors — ungrounded conductors, grounded conductors, equipment <u>grounded-grounding</u> conductors, or grounding electrode conductors.
Statement (technical reason for FR)	This editorial revision matches the section with the rest of Section 4.19.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.19.2.13	84	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	4.19.2.13* Earth-Grounding Electrode <u>Conductor Connections</u>. The resistance of the earth electrode system used in the grounding of SPDs shall comply with SPD grounding connections shall comply with Article 250 of NFPA 70.		
First Revision Text (FR)	4.19.2.13* Earth-Grounding Electrode <u>System</u>. The resistance of the earth electrode system used in the grounding of SPDs shall comply with NFPA 70. A.4.19.2.13 The effectiveness of an SPD is based on the impedance of the path to ground. A lower impedance minimizes the voltage differences of conductors attached to SPDs near the service entrance and reduces the chance of arcing or insulation breach. Consequently, it is essential to minimize impedance in this circuit.		
Statement (technical reason for FR)	This removes the term “earth” and adds “system” to better correlate with NFPA 70.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
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New 4.19.2.15	74	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	4.19.2.15 SPD's shall be accessible for inspection and maintenance.		
First Revision Text (FR)	4.19.2.15 <u>SPDs shall be installed to ensure they are accessible for inspection and maintenance.</u>		
Statement (technical reason for FR)	This adds a requirement for SPDs to be installed where they can be accessed for inspection and maintenance which is currently not addressed in the standard.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New 4.19.2.16	85	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	4.19.2.15 Indicating. An SPD shall provide indication that it is functioning properly.		
First Revision Text (FR)	4.19.2.16 Indicating. <u>An SPD shall provide visual indication that it is functioning properly.</u>		
Statement (technical reason for FR)	This harmonizes the standard with NFPA 70 and ensures the functionality of the SPD has visual indication.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
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4.19.3.7	70	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	4.19.3.7 The conductor between the surge arrester and the line and the surge arrester and the grounding connection shall be not smaller than 6 AWG copper or 4 AWG aluminum, or it shall utilize a conductive material that has a capacity and withstand rating equivalent to at least a 6 AWG <u>copper</u> conductor.		
First Revision Text (FR)	4.19.3.7 The conductor between the surge arrester and the line and the surge arrester and the grounding connection shall be not smaller than 6 AWG copper or <u>4 AWG</u> aluminum, or it shall utilize a conductive material that has a capacity and withstand rating equivalent to at least a 6 AWG <u>copper</u> conductor.		
Statement (technical reason for FR)	This adds a corresponding AWG size for aluminum conductors and ensures an alternative conductive material has a withstand rating at least 6 AWG of the copper type conductor.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New 4.19.3.9	75	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	4.19.3.9 Surge arresters shall be accessible for inspection and maintenance.		
First Revision Text (FR)	<u>4.19.3.9</u> <u>Surge arresters shall be installed to ensure they are accessible for inspection and maintenance.</u>		
Statement (technical reason for FR)	This adds a requirement for surge arresters to be installed where they can be accessed for inspection and maintenance which is currently not addressed in the standard.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.19.4.3	71	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	4.19.4.3* Surge protectors shall have a maximum discharge current (I_{max}) rating of at least 10 kA 8/20 μ s when installed at the entrance-service equipment .		
First Revision Text (FR)	4.19.4.3* Surge protectors shall have a maximum discharge current (I_{max}) rating of at least 10 kA 8/20 μ s when installed <u>in accordance with 4.19.4.2 at the entrance</u> . A.4.19.4.3 Where surge protectors having a rating of 10 kA 8/20 μ s do not exist, devices complying with the requirements of Section 1.3 should be installed.		
Statement (technical reason for FR)	This points the user back to 4.19.4.2 where surge protectors are installed.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.19.4.5	72, 73	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	4.19.4.5* Surge protectors shall be grounded. A.4.19.4. 5 <u>1</u> Additional information on the surge parameters of isolating transformers can be found in IEEE C62.69-2016, <i>Standard for the Surge Parameters of Isolating Transformers Used in Networking Devices and Equipment</i> ; IEEE C62.36-2016, <i>Standard Test Methods for Surge Protectors and Protective Circuits Used in Information and Communications Technology (ICT) Circuits, and Smart Grid Data Circuits</i> ; and IEEE C62.43-2005, <i>Guide for the Application of Surge Protectors Used in Low-Voltage (Equal to or Less than 1000 Vrms or 1200 Vdc) Data, Communications, and Signaling Circuits</i> . 4.19.4.5.1 * Surge protectors that perform their protection function through isolation shall not be required to be grounded.		

	4.19.4.5.2* Surge protectors that do not perform their surge protection function through isolation shall be grounded in accordance with Chapter 8 of <i>NFPA 70</i>.
First Revision Text (FR)	4.19.4.5* Surge protectors shall be grounded. A.4.19.4.5.<u>1</u> Additional information on the surge parameters of isolating transformers can be found in IEEE C62.69-2016, Standard for the Surge Parameters of Isolating Transformers Used in Networking Devices and Equipment; IEEE C62.36-2016, Standard Test Methods for Surge Protectors and Protective Circuits Used in Information and Communications Technology (ICT) Circuits, and Smart Grid Data Circuits; and IEEE C62.43-2005, Guide for the Application of Surge Protectors Used in Low-Voltage (Equal to or Less than 1000 Vrms or 1200 Vdc) Data, Communications, and Signaling Circuits. 4.19.4.5.1* Surge protectors that perform their protection function through isolation shall not be required to be grounded. 4.19.4.5.2* Surge protectors that do not perform their surge protection function through isolation shall be grounded in accordance with Chapter 8 of NFPA 70. A.4.19.4.5.2 The purpose of a surge protector is to equalize conductor-to-conductor and conductor-to-ground potential. While a good ground is important, a good bond is imperative to minimize the damage caused by lightning and power contact or induction. Common mode is a mode of protecting telecommunications lines, data lines, and so forth. This mode places the protector between the signal conductor and the ground. It is analogous to L–G mode in power systems. Differential mode is a mode of protecting telecommunications lines, data lines, and so forth. In this mode, a protector is placed between the individual signal lines, analogous to the L–L mode of protection in power systems.
Statement (technical reason for FR)	This aligns the annex material with the correct section in 4.19.4.5.1.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.19.5 and .6	86	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	Sections 4.19.5, 4.19.6 4.19.5 Communications Surge Protection. 4.19.5.1— SPDs shall be provided for all communications systems (including, but not limited to, CATV, alarm, and data systems) and antenna systems at facility entrances. 4.19.5.2— SPDs protecting communications systems shall be grounded, with the exception of devices that perform their surge protection function through isolation. 4.19.5.2.1*— SPDs for data and signal line protection shall provide common mode protection, with the exception of devices that perform their surge protection function through isolation. 4.19.5.3 Utility-Owned Communication Equipment. 4.19.5.3.1— SPDs shall be provided on all proprietary equipment by communication utility providers or tenant communication utilities. 4.19.6 Installation. 4.19.6.1— Installation of surge suppression hardware shall conform to the requirements of NFPA 70.		
First Revision Text (FR)	4.19.5 Communications Surge Protection. 4.19.5.1 SPDs shall be provided for all communications systems (including, but not limited to, CATV, alarm, and data systems) and antenna systems at facility entrances. 4.19.5.2 SPDs protecting communications systems shall be grounded, with the exception of devices that perform their surge protection function through isolation. 4.19.5.2.1* SPDs for data and signal line protection shall provide common mode protection, with the exception of devices that perform their surge protection function through isolation. A.4.19.5.2.1		

	Differential mode protection should also be provided where practicable. 4.19.5.3 Utility-Owned Communication Equipment. 4.19.5.3.1 SPDs shall be provided on all proprietary equipment by communication utility providers or tenant communication utilities. 4.19.6 Installation. 4.19.6.1 Installation of surge suppression hardware shall conform to the requirements of NFPA 70.
Statement (technical reason for FR)	This deletes legacy language intended to be removed during the last revision cycle. All the corresponding language is included in 4.19.4.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
7.3.1	87	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	7.3.1 Materials and Installation. Conductors, strike termination devices, surge protection devices , and grounding connections shall be selected and installed in accordance with the requirements of Chapter 4 except as modified in this chapter.		
First Revision Text (FR)	7.3.1 Materials and Installation. Conductors, strike termination devices, surge protection devices , and grounding connections shall be selected and installed in accordance with the requirements of Chapter 4 except as modified in this chapter.		
Statement (technical reason for FR)	The section is revised to apply to all types of surge protection permitted or required by Section 4.19 and not just SPDs.		
Response (technical reason for not making some			

changes or for resolving)	
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Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
7.3.6.2	88	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	7.3.6.2 Surge protective devices protection means shall be installed outside hazardous (classified) locations where practicable.		
First Revision Text (FR)	7.3.6.2 Surge <u>protection equipment</u> protective devices shall be installed outside hazardous (classified) locations where practicable.		
Statement (technical reason for FR)	This ensures all surge protection permitted or required in Section 4.19 is installed outside the hazardous location.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
Global	135	126, 141, 125, 136, 151	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	Remove "Standard for" from all UL, CAN/ULC standard titles.		
First Revision Text (FR)	Remove "Standard for" from all UL, CAN/ULC standard titles throughout the standard.		
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	Create First Revision —Changes are part of broader UL program to update referenced documents.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
1.6	148	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	1.6* Maintenance. Guidelines for the maintenance of the lightning protection system shall be provided to the owner at the completion of installation.		
First Revision Text (FR)	1.6* Maintenance. Recommended guidelines Guidelines for the maintenance of the lightning protection system shall be provided to the owner at the completion of installation.		
Statement (technical reason for FR)	Create First Revision — <u>The proposed change clarifies the section.</u>		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
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1.7	149	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	1.7 Periodic Inspection. Inspections or testing for compliance to this standard shall be done <u>yearly, or</u> at intervals determined by the authority having jurisdiction.		
First Revision Text (FR)	1.7 Periodic Inspection. Periodic inspections or testing for compliance to this standard shall be done at intervals determined by the authority having jurisdiction.		
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	<u>Resolve</u> —Leaving <u>Periodic-periodic</u> in the section sets the time frame.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
1.8.1	40	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	1.8.1 The values stated shall be a minimum requirement.		
First Revision Text (FR)	1.8.1 The values stated shall be a minimum requirement, and standard deviations are not permitted.		
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	<u>Resolve</u> —The section is clear as currently written. The <u>proposal-proposed text</u> would allow material standard deviations into the standard and that is what this section addresses.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
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5.8.3	118	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	5.8.3 Where lights are installed at the perimeter of the pad and extend above the edge of the helipad, air terminals shall be installed <u>to include each light in a zone of protection.</u>		
First Revision Text (FR)	5.8.3 Where lights are installed at the perimeter of the pad and extend above the edge of the helipad, air terminals shall be installed adjacent to the fixture <u>to include each light in a zone of protection.</u>		
Statement (technical reason for FR)	<u>The proposal adds clarity. This clarifies</u> to the section and helps the user implement this requirement.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New 5.10	150	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	5.10 Outdoor Athletic Scoreboards The lightning protection systems for outdoor athletic scoreboards that are integrated with egress lighting, and audio mass notification systems shall be examined annually as required in other sections. That examination should include a record of historic activation in nearby lightning protection systems to confirm placement of the sensing components and performance of the integrated systems in the event of a power outage.		
First Revision Text (FR)	5.10* Outdoor Athletic Scoreboards A.5.10 A lightning protection system for outdoor athletic scoreboards shall <u>should</u> consider egress lighting and audio mass notification systems as part of the lightning risk assessment and in the development of its maintenance schedule outlined in Section 1.7. Where lightning detection systems are utilized, the inspection should include a record of historic activation in nearby lightning detection systems to confirm placement of the sensing components and performance of the integrated systems in the event of a power outage 5.10.1 Outdoor athletic scoreboards shall be protected in accordance with the requirements in Chapter 4. 5.10.2		

Commented [CC1]: Can't have requirement in annex.

	Surge protection shall be provided for all circuits entering or exiting outdoor scoreboards in accordance with Section 4.19.
Statement (technical reason for FR)	The submitters' PI did not include any requirements and had multiple topics discussed. The FR is written to reflect the intent of the submitter by adding adds specific requirements and guidance to Chapter 5 along with annex material to add information regarding systems that may be present in athletic field locations.
Response (technical reason for not making some changes or for resolving)	

Commented [CC2]: Don't refer to submitter, PI, etc in statement. This should be technical reason why TC is making change.

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
A.11.1.1	76	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	A.11.1.1 Chapter 11 pertains to lightning protection of airfield lighting systems. These systems are installed underground in both paved (e.g., full-strength pavement and shoulder pavement) and unpaved areas. The protected components include in-pavement fixtures, elevated fixtures, airfield signs, underground power systems, communications systems, control and signal circuits, and components of runway, taxiway, and apron lighting systems. These systems are installed in the portions of an airport that encompass the approach, departure, landing, takeoff, taxiing, and parking areas for aircraft. These areas include runways, taxiways, and other parts of an airport used for taxiing, takeoff, and landing of aircraft; loading ramps; and parking areas exclusive of building-mounted helipads, approach light structures, and antennas. This chapter could also apply to other areas with airfield lighting systems. There are two generally accepted methods for providing lightning protection for airfield lighting circuits: equipotential and isolation. The equipotential method, which is described in 11.4.2.6.1, is shown in Figure A.11.1.1(a). The isolation method, which is described in 11.4.2.6.2, is shown in Figure A.11.1.1(b). The two methods should not be employed on a single circuit. The designer should select the installation method based on sound engineering practices and the success of the selected method in previous installations. <u>An Equipotential lightning protection system is typically more economical to install and provides excellent protection from the effects of lightning in areas of high lightning flash density.</u>		
First Revision Text (FR)	A.11.1.1 Chapter 11 pertains to lightning protection of airfield lighting systems. These systems are installed underground in both paved (e.g., full-strength pavement and shoulder pavement) and unpaved areas. The protected components include in-pavement fixtures, elevated fixtures, airfield signs, underground power systems, communications systems, control and signal circuits, and components of runway, taxiway, and apron lighting systems. These systems are installed in the portions of an airport that encompass the approach, departure, landing,		

	takeoff, taxiing, and parking areas for aircraft. These areas include runways, taxiways, and other parts of an airport used for taxiing, takeoff, and landing of aircraft; loading ramps; and parking areas exclusive of building-mounted helipads, approach light structures, and antennas. This chapter could also apply to other areas with airfield lighting systems. There are two generally accepted methods for providing lightning protection for airfield lighting circuits: equipotential and isolation. The equipotential method, which is described in 11.4.2.6.1, is shown in Figure A.11.1.1(a). The isolation method, which is described in 11.4.2.6.2, is shown in Figure A.11.1.1(b). The two methods should not be employed on a single circuit. The designer should select the installation method based on sound engineering practices and the success of the selected method in previous installations. An equipotential lightning protection system is typically more economical to install and provides excellent protection from the effects of lightning in areas of high lightning flash density.
Statement (technical reason for FR)	Create First Revision —The additional language clarifies to the user that the two methods offer equal protection.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
11.4.2.6	78	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)			
First Revision Text (FR)	11.4.2.6* The counterpoise conductor shall be installed by using one of the following methods: 1. Equipotential method as described in 11.4.2.6.1. 2. Isolation method as described in 11.4.2.6.2. A.11.4.2.6 The two methods are not listed in preferred order.		

Commented [CC3]: The statement makes it sound as if this is all to be deleted.

Statement (technical reason for FR)	Create First Revision —The removed language adds no clarity. By removing the section, this now correlates with other sections in the document and is understood that a list in the document is not in preferential order.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
A.11.4.2.6.1.2	79	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	A.11.4.2.6.1.2 Airfield pavement systems design is an intricate engineering solution involving a large number of complex variables. Operating aircraft and pavement systems interact with each other. This interaction must be addressed by the pavement design process. Structural designs of airfield pavement systems include the determination of the overall pavement system thickness to achieve the final design objectives. Airfield pavement systems are normally constructed in courses or layers. Many factors influence the pavement system layer thicknesses required to provide satisfactory pavement system design. Two key components that affect the structural design of the pavement system are the type of pavement and the load-bearing capacity of the supporting materials. A typical pavement system design might consist of the following layers: (1) Conditioned and compacted earth fill and subgrade below the pavement system (typically 100 percent compaction required) (2) Enhanced sub-base course material, including additional layering, or enhanced existing subgrade (3) Pavement base course (flexible or semi-rigid materials to support the pavement surface materials) (4) Final pavement surface, either hot mix asphalt (HMA), a flexible pavement typically installed in multiple layers, or Portland cement concrete (PCC), a rigid pavement typically installed in one layer The thickness of each of the overall pavement layers is determined based on <u>by</u> the structural requirements of the pavement system <u>contingent</u> on existing conditions, aircraft sizes and weights, number of aircraft operations, environmental factors, and other features. The airfield lighting system is incorporated into the airfield pavement system. The design of the depth and height of the various airfield lighting system components, including light bases, light base accessories, conduits, and counterpoise conductors, must be adjusted to integrate the components into the varying pavement system layer thicknesses. Although reasonable effort should be made to comply with the 8 in. (200 mm) requirement contained in 11.4.2.6.1.1, it is for these reasons that the variation described in 11.4.2.6.1.2 is necessary.		
First Revision Text (FR)	A.11.4.2.6.1.2 Airfield pavement systems design is an intricate engineering solution involving a large number of complex variables. Operating aircraft and pavement systems interact with each other. This interaction must be addressed by the pavement		

	design process. Structural designs of airfield pavement systems include the determination of the overall pavement system thickness to achieve the final design objectives. Airfield pavement systems are normally constructed in courses or layers. Many factors influence the pavement system layer thicknesses required to provide satisfactory pavement system design. Two key components that affect the structural design of the pavement system are the type of pavement and the load-bearing capacity of the supporting materials. A typical pavement system design might consist of the following layers: 1. Conditioned and compacted earth fill and subgrade below the pavement system (typically 100 percent compaction required) 2. Enhanced sub-base course material, including additional layering, or enhanced existing subgrade 3. Pavement base course (flexible or semi-rigid materials to support the pavement surface materials) 4. Final pavement surface, either hot mix asphalt (HMA), a flexible pavement typically installed in multiple layers, or Portland cement concrete (PCC), a rigid pavement typically installed in one layer The thickness of each of the overall pavement layers is determined based on by the structural requirements of the pavement system based-contingent on existing conditions, aircraft sizes and weights, number of aircraft operations, environmental factors, and other features. The airfield lighting system is incorporated into the airfield pavement system. The design of the depth and height of the various airfield lighting system components, including light bases, light base accessories, conduits, and counterpoise conductors, must be adjusted to integrate the components into the varying pavement system layer thicknesses. Although reasonable effort should be made to comply with the 8 in. (200 mm) requirement contained in 11.4.2.6.1.1, it is for these reasons that the variation described in 11.4.2.6.1.2 is necessary.
Statement (technical reason for FR)	Create First Revision —tThe edit clarifies the language in the section.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
A.11.4.5.1	80	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	A.11.4.5.1 The grounding electrode can be installed in the same excavation or trench as the counterpoise conductor or light base .		
First Revision Text (FR)	A.11.4.5.1 The grounding electrode can be installed in the same excavation or trench as the counterpoise conductor or light base .		
Statement (technical reason for FR)	Create First Revision —The grounding electrode can be installed in the same excavation as the counterpoise conductor. The additional language makes this clear to the user.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
O.1.2.1	124	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	O.1.2.1 API Publications. American Petroleum Institute, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001-5571. API RP 2003, Recommended Practice for Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents, current edition. API 650, Welded Steel Tanks for Oil Storage , November 1998; Errata, April 2007.		
First Revision Text (FR)	O.1.2.1 API Publications. American Petroleum Institute, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001-5571. API RP 545, Recommended Practice for Lightning Protection of Aboveground Storage Tanks for Flammable or Combustible Liquids, October 2009. API RP 2003		

Commented [CC4]: You did not show this. Did you intend for it to be deleted.

	Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents, Eighth Edition, 2020. API 650, Welded Steel Tanks for Oil Storage, current edition.
Statement (technical reason for FR)	Create First Revision —The change updates the API publications to reflect changes since the last cycle.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
O.1.2.6	125	136 , 151 , 135	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	O.1.2.6—UL Publications: Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096. UL 96, Standard for Safety, Lightning Protection Components, current edition. UL 96A, Standard for Safety, Installation Requirements for Lightning Protection Systems, current edition. UL 497, Safety Protectors for Paired-Conductor Communications Circuits, 2013. UL 497A, Standard for Secondary Protectors for Communications Circuits, 2019. UL 497B, Standard for Protectors for Data Communications and Fire Alarm Circuits, 2004. UL 497C, Standard for Protectors for Coaxial Communications Circuits, 2001. UL 497D, Outline of Investigation for Component Secondary Protectors for Communications Circuits Used with Specified Voltage Suppression, 2007. UL 497E, Outline of Investigation for Protectors for Antenna Lead-In Conductors, 2007. UL 1449, Safety for Surge Protective Devices, 2018.		
First Revision Text (FR)	See below for revised text.		
Statement (technical reason for FR)			
Response (technical reason for not making some	Resolve —Action taken under PI 135 and 136		

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changes or for resolving)			
	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
	136, 125 , 135 , 151	125, 151, 135	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	O.1.2.6 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096. UL 497, <i>Safety Protectors for Paired-Conductor Communications Circuits</i>, 2001, revised 2022. UL 497A, <i>Secondary Protectors for Communications Circuits</i>, 2001, revised 2019. UL 497B, <i>Protectors for Data Communications and Fire-Alarm Circuits</i>, 2004, revised 2021. UL 497C, <i>Protectors for Coaxial Communications Circuits</i>, 2001, revised 2021. UL 497D, <i>Outline of Investigation for Component Secondary Protectors for Communications Circuits Used with Specified Voltage Suppression</i>, 2007. UL 497E, <i>Outline of Investigation for Protectors for Antenna Lead-In Conductors</i>, 2011. UL 1449, <i>Safety for Surge Protective Devices</i>, 2021, revised 2022.		
First Revision Text (FR)	O.1.2.6 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096. UL 497, <i>Safety Protectors for Paired-Conductor Communications Circuits</i>, 20132001, revised 2022. UL 497A, <i>Standard for Secondary Protectors for Communications Circuits</i>, 2001, revised 2019. UL 497B, <i>Standard for Protectors for Data Communications and Fire-Alarm Circuits</i>, 2004, revised 2021. UL 497C, <i>Standard for Protectors for Coaxial Communications Circuits</i>, 2001, revised 2021. UL 497D, <i>Outline of Investigation for Component Secondary Protectors for Communications Circuits Used with Specified Voltage Suppression</i>, 2007. UL 497E, <i>Outline of Investigation for Protectors for Antenna Lead-In Conductors</i>, 20072011. UL 1449, <i>Safety for Surge Protective Devices</i>, 2018 2021, revised 2022.		
Statement (technical reason for FR)	Create First Revision—This updates all the UL documents that are applicable to this standard and incorporates the global input of removing the word “Standard” from the title.		

Response (technical reason for not making some changes or for resolving)			
	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
	151	125, 136, 135	☐ Create First Revision
			☒ Resolve
Proposed Text (PI)	O.1.2.6 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096. UL 497, Safety Protectors for Paired-Conductor Communications Circuits, 2013. UL 497A, Standard for Secondary Protectors for Communications Circuits, 2019. UL 497B, Standard for Protectors for Data Communications and Fire-Alarm Circuits, 2004. UL 497C, Standard for Protectors for Coaxial Communications Circuits, 2001. UL 497D, Outline of Investigation for Component Secondary Protectors for Communications Circuits Used with Specified Voltage Suppression, 2007. UL 497E, Outline of Investigation for Protectors for Antenna Lead-In Conductors, 2007. UL 1449, Safety for Surge Protective Devices, 2018. UL Marking and Application Guide: Lightning Protection July 2016		
First Revision Text (FR)	See below for revised text.		
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	Resolve—Action taken under PI 135 and 136. Additional UL document is not a published standard.		
First Revision Text (FR)	O.1.2.6 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096. UL 497, Safety Protectors for Paired-Conductor Communications Circuits, 2013. UL 497A, Standard for Secondary Protectors for Communications Circuits, 2019. UL 497B, Standard for Protectors for Data Communications and Fire-Alarm Circuits, 2004.		

	UL 497C, Standard for Protectors for Coaxial Communications Circuits, 2001. UL 497D, Outline of Investigation for Component Secondary Protectors for Communications Circuits Used with Specified Voltage Suppression, 2007. UL 497E, Outline of Investigation for Protectors for Antenna Lead-In Conductors, 2007. UL 1449, Safety for Surge Protective Devices, 2018.
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Section	All PIs used for FR or Resolve	Other Pis that propose revisions for this section	MOTION
O.2.4	126	141, 135	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	.		
First Revision Text (FR)	O.2.4 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096. UL 497, Protectors for Paired Conductor Communications Circuits, revision 2001, revised 2022. UL 497A, Secondary Protectors for Communications Circuits, revision 2001, revised 2019. UL 497B, Protectors for Data Communications and Fire Alarm Circuits, 2004, revision 2021. UL 497C, Protectors for Coaxial Communications Circuits, revision 2001, revised 2021. UL 497E, Outline of Investigation for Protectors for Antenna Lead-In Conductors, revision 2011.		
Statement (technical reason for FR)	Section O.2.4 is deleted as the text is already contained in O.1.2.6.		
Response (technical reason for not making some changes or for resolving)			
	All PIs used for FR or Resolve	Other Pis that propose revisions for this section	MOTION
	126 , 141	126, 135	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	O.2.4 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096. UL 497, <i>Protectors for Paired Conductor Communications Circuits</i> , revision 2001 , revised 2022 .		

Commented [CC6]: Need a create revision to delete section.

	UL 497A, <i>Secondary Protectors for Communications Circuits</i>, revision <u>2001</u>, revised 2019. UL 497B, <i>Protectors for Data Communications and Fire Alarm Circuits</i>, <u>2004</u>, revision <u>2021</u>. UL 497C, <i>Protectors for Coaxial Communications Circuits</i>, revision <u>2001</u>, revised 2021. UL 497E, <i>Outline of Investigation for Protectors for Antenna Lead-In Conductors</i>, revision 2011.
First Revision Text (FR)	Q.2.4 UL Publications: Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096. UL 497, <i>Protectors for Paired Conductor Communications Circuits</i>, revision <u>2001</u>, revised 2022. UL 497A, <i>Secondary Protectors for Communications Circuits</i>, revision <u>2001</u>, revised 2019. UL 497B, <i>Protectors for Data Communications and Fire Alarm Circuits</i>, <u>2004</u>, revision <u>2021</u>. UL 497C, <i>Protectors for Coaxial Communications Circuits</i>, revision <u>2001</u>, revised 2021. UL 497E, <i>Outline of Investigation for Protectors for Antenna Lead-In Conductors</i>, revision 2011.
Statement (technical reason for FR)	
Response (technical reason for not making some changes or for resolving)	This section was deleted under a separate revision.

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New A.4.1.1.3	121	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	A.4.1.1.3 Where Class II conductors are required, the impedance of the current path to ground is an important factor in limiting the voltage at upper parts of the structure. For multi-level structures that contain both Class I and Class II components, the impedance of the Class II conductors must be maintained throughout its path to ground. This may be achieved through a continuous path of Class II conductors or through current division using some components of the current dissipation systems that are equipped with Class I materials.		
First Revision Text (FR)	A.4.1.1.3 Where Class II conductors are required, the impedance of the current path to ground is an important factor in limiting the voltage at upper parts of the structure. For multi-level structures that contain both Class I and Class II components, the impedance of the Class II conductors must be maintained throughout its path to ground. This is achieved through a continuous path of Class II conductors and through current division using some components of the current dissipation systems that are equipped with Class I materials.		
Statement (technical reason for FR)	The new annex clarifies that the Class I components in a mixed class I and II structure share in the current division during conduction of lightning current to ground, thus lowering overall system impedance.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New 4.1.1.1.3 and 4.1.1.1.4	122	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	4.1.1.1.3. Structures located in corrosive environments shall be protected with Class III materials. 4.1.1.1.4 Class III materials shall meet the minimum requirements for Class II materials, and be constructed of corrosion resistant materials, such as stainless steel, titanium, Monel®, or Hastelloy®.		
First Revision Text (FR)	To create a FR, revise text above or paste final version here.		

Statement (technical reason for FR)	
Response (technical reason for not making some changes or for resolving)	1) Class III materials are not defined in this standard. 2) The use of Class III materials should be confined to specific applications which may include heavy-duty stacks and tanks, etc. 3) UL 96A only mentions use of Class III on heavy-duty stacks. NOTE TO TECHNCICLA COMMITTEE: WG recognizes the proposal has merit but needs some additional limitations or correct placement in the standard for adoption.

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.2.2.3.1	137	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	4.2.2.3.1* Aluminum shall not be used within 18 in. (450 mm) of the point where the lightning protection system comes into contact with the earth or <u>soil on vegetative roofs or planters</u> or where rapid deterioration is possible.		
First Revision Text (FR)	4.2.2.3.1* Aluminum shall not be used within 18 in. (450 mm) of the point where the lightning protection system comes into contact with the earth, <u>soil on vegetative roofs, planters</u> or where rapid deterioration is possible.		
Statement (technical reason for FR)	Aluminum components of a lightning protection systems can exist in proximity to soil at other locations than at ground level.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New 4.2.2.3.3	49	None	☐ Create First Revision ☒ Resolve

Proposed Text (PI)	4.2.2.3.3 Aluminum conductors shall not be installed where subject to continuous moisture.
First Revision Text (FR)	To create a FR, revise text above or paste final version here.
Statement (technical reason for FR)	
Response (technical reason for not making some changes or for resolving)	The proposed text is redundant with existing 4.3.3.

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.3.4.3	41	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	4.3.4.3 <u>Connectors</u> used for the connection of aluminum down conductors to copper or copper-clad grounding equipment shall be of the bimetallic type.		
First Revision Text (FR)	4.3.4.3 <u>Connectors and F</u> ittings used for the connection of aluminum down conductors to copper or copper-clad grounding equipment shall be of the bimetallic type.		
Statement (technical reason for FR)	This revision makes 4.3.4.3 consistent with the intent of the overall 4.3.4 which encompasses both connectors and fittings.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New 4.4.2.1 and 4.4.2.2	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
	81, 68	68	☒ Create First Revision ☐ Resolve

Proposed Text (PI)	4.4.2.1 A ferrous metal sleeve 8 in. or less in length shall require bonding on one end only. 4.4.2.2 A ferrous metal sleeve 2 in. or less in length shall not require bonding on either end.
First Revision Text (FR)	See below for revised text.
Statement (technical reason for FR)	The requirement to bond metal penetrations of LPS conductors is not explained elsewhere in the standard. Annex A.4.4.2 assists in correct implementation of the normative requirements. Calculation of the potential for sideflash in down conductors routed through minimal length metal tubing suggests little impact. The minimal length metal tubing bonding rules can be relaxed.
Response (technical reason for not making some changes or for resolving)	
First Revision Text (FR)	4.4.2 Where metal pipe or tubing is used around a conductor, the conductor shall be bonded to the pipe or tubing at both ends. A.4.4.2 Whenever a metal sleeve encloses/encircles a lightning protection conductor the LPS conductor should be bonded to the sleeve at each end. Skin effect will keep the higher frequency components of the lightning impulse current on the outer sleeve while the lower frequency currents flow through the lower resistance LPS conductor. The bond eliminates arcing that can damage the conductor. 4.4.2.1 Metal pipe or tubing 8 in. or less in length shall require bonding on one end only. 4.4.2.2 Metal pipe or tubing 2 in. or less in length shall not require bonding on either end.

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
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4.5.2.2.2	91	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	4.5.2.2.2 Air terminals exceeding 24 in. (600 mm) in height shall be supported <u>braced</u> at a point not less than one-half their height, as shown in Figure 4.5.2.2.2. <u>Side bracing shall not be required if an air terminal and its mounting base, as installed on steel or concrete, is capable of withstanding a tipping force of 2.2 lbs (0.9979032 kg) per foot (0.3048 m) of unbraced elevation conductor length at its tip.</u> <u>An anchored, threaded base shall be considered as one location.</u>		
First Revision Text (FR)	4.5.2.2.2 Air terminals exceeding 24 in. (600 mm) in height shall be supported at a point not less than one-half their height, as shown in Figure 4.5.2.2.2.		
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	It is difficult to verify or confirm wind loading or force on the unsupported air terminal. NOTE TO TECHNICAL COMMITTEE: We suggest forming a task group to consider listed air terminal products in excess of 24 inches that could be installed without bracing.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.5.4.4	127	50	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	4.5.4.4 Overhead ground wires shall be <u>able to provide</u> minimum sag under all conditions.		
First Revision Text (FR)	A4.5.4.4 Overhead ground wires shall be self-supporting with minimum sag under all conditions.		
Statement (technical reason for FR)			
Response (technical reason for not making some			

changes or for resolving)			
A.4.5.4.4	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
	50	127	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	A.4.5.4.4 Need help with this text. Minimum sag is not defined in standard. How much sag is permissible, how does conductor movement impact the zone of protection?		
First Revision Text (FR)	See below for revised text.		
Statement (technical reason for FR)	This is no need to define minimum sag.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
A.4.7.2.3	51	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	A.4.7.2.3 The purpose of Figure 4.7.2.43(b) is to provide a graphical representation of the area protected by the upper roof. The reference point is the eave because the criteria in 4.7.3 have been met and, thus, air terminals are not required on the <u>eave</u> . It has been determined that this area is not susceptible to a direct strike.		
First Revision Text (FR)	A.4.7.2.3 The purpose of Figure 4.7.2.43(b) is to provide a graphical representation of the area protected by the upper roof. The reference point is the eave because the criteria in 4.7.3 have been met and, thus, air terminals are not required on the <u>ridgeeave</u> . It has been determined that this area is not susceptible to a direct strike.		
Statement (technical reason for FR)	The explanatory annex material is corrected by referring to the correct figure and to the correct nomenclature in the figure (i.e., eave, not ridge).		
Response (technical reason for			

not making some changes or for resolving)	
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Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.8.3.2	114	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	4.8.3.2 Permanent exterior metal handrails-, ladders and other metal components of a structure that are <u>not</u> subject to direct lightning strikes (e.g., <u>within a zone of protection</u>) and are electrically continuous shall be permitted to be used as main <u>and down</u> conductors where the minimum thickness is 0.064 in. (1.63 mm).		
First Revision Text (FR)	4.8.3.2 Permanent exterior metal handrails and ladders that are subject to direct lightning strikes (e.g., on roofs or between roofs) and are electrically continuous shall be permitted to be used as main conductors where the minimum thickness is 0.064 in. (1.63 mm).		
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	The current language in 4.8.3.2 is a specific exception for ladders and handrails. The proposed text broadens the applicability of the exception, that is outside of the intent of the current language and creates conflict with the requirements of section 4.18.1. NOTE TO TECHNICAL COMMITTEE We suggest the addition of annex material to explain the reason and limitations of this exception.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.8.4.3	139	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	4.8.4.3 <u>All conductors</u> shall be permitted to be routed in an upward coursing for a vertical distance of no greater than 8 in. (200 mm) at through-roof or through-wall connections only, in order to mitigate tripping hazards, provided that the coursing complies with 4.8.5.		
First Revision Text (FR)	4.8.4.3		

	Conductors shall be permitted to be routed in an upward coursing for a vertical distance of no greater than 8 in. (200 mm) at through-roof or through-wall connections only, in order to mitigate tripping hazards, provided that the coursing complies with 4.8.5.
Statement (technical reason for FR)	
Response (technical reason for not making some changes or for resolving)	The current language of 4.8.4.3 encompasses 'conductors' as defined in NFPA 780. Adding 'all' is unnecessary.

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.8.7.2	52	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	4.8.7.2 Conductors shall be coursed through or around obstructions (e.g., cupolas and ventilators) in a horizontal plane.		
First Revision Text (FR)	4.8.7.2 Conductors shall be coursed through or around obstructions (e.g., cupolas and ventilators) in <u>at the same</u> horizontal plane <u>with as</u> the main conductor.		
Statement (technical reason for FR)	The section was revised to clarify that the intent is to have conductors routed in consideration of obstructions in the same horizontal plane as main conductors.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New A.4.8.11	67	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	A.4.8.11 Whenever a ferrous metal sleeve encloses/encircles a lightning protection conductor the LPS conductor should be bonded to the sleeve at each end. Skin effect will keep the higher frequency components of the lightning impulse current		

	on the outer sleeve while the lower frequency currents flow through the lower resistance LPS conductor. The bond eliminates arcing that can damage the conductor.
First Revision Text (FR)	4.8.11 Protecting Down Conductors. Down conductors located where subject to physical damage or displacement shall be guarded.
Statement (technical reason for FR)	
Response (technical reason for not making some changes or for resolving)	Action taken on PI 81 provide some relaxation of the tubing bonding requirement.

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.9	140	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	4.9 <u>All conductors</u> shall be fastened to the structure upon which they are placed at intervals not exceeding 3 ft (1 m).		
First Revision Text (FR)	4.9 Conductors shall be fastened to the structure upon which they are placed at intervals not exceeding 3 ft (1 m).		
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	The current language of 4.9 Section encompasses 'conductors' as defined in NFPA 780. Adding 'all' is unnecessary.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.11.2	42	None	☒ Create First Revision ☐ Resolve

Proposed Text (PI)	4.11.2 <u>Connectors</u> used for required connections to metal bodies in or on a structure shall be secured to the metal body by bolting, brazing, welding, screwing, or high-compression connectors listed for the purpose.
First Revision Text (FR)	4.11.2 Fittings <u>Connectors</u> used for required connections to metal bodies in or on a structure shall be secured to the metal body by bolting, brazing, welding, screwing, or high-compression connectors listed for the purpose.
Statement (technical reason for FR)	The language is changed to a defined item in NFPA 780 and makes 4.11.2 consistent with the rest of 4.11.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.12.1.1	117	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	4.12.1.1* Each down conductor shall terminate to one of the following: (1) One or more grounding electrodes dedicated to the lightning protection system (2) *A grounding electrode system of a building, structure, or facility that has multiple grounding electrodes bonded together		
First Revision Text (FR)	4.12.1.1* Each down conductor shall terminate to one of the following: 1. One or more grounding electrodes dedicated to the lightning protection system 2. *A grounding electrode system of a building, structure, or facility that has multiple grounding electrodes bonded together with a ground ring electrode meeting the requirements of 4.12.4, <u>if practicable.</u> A.4.12.1.1 A grid grounding electrode system meeting the requirements of 4.12.4 is considered equivalent to a ground ring electrode.		

	A.4.12.1.1(2) For lightning protection, a single integrated (interconnected) grounding system including lightning protection, power systems, communications systems, and other grounded systems is preferable.
Statement (technical reason for FR)	Situations occur where a ground ring electrode cannot be implemented on some structures but also that the ground ring electrode is the best solution for the interconnection of ground electrodes, including those not dedicated to the lightning protection system.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New 4.12.7	146	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	4.12.7 Metallic Piles Where a building foundation consists of driven metallic piles, the piles may be used as part of the grounding electrode system. Where a metallic pile is used as a grounding electrode, the down conductor shall be connected to it using in accordance with the requirements of 4.18.3.		
First Revision Text (FR)	To create a FR, revise text above or paste final version here.		
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	The submitter of the PI does not address key issues involved with implementing metallic piles as part of the grounding electrode system. NOTE TO TECHNICAL COMMITTEE: Need to address requirement for new construction only (as in 4.12.3) non-conductive coating or passivation of the piles, permitting piles in lieu of other grounding electrodes (as in 4.12.3 and reconciliation with 4.12.1.3.).		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
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A.4.13.3	5, 69	69	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	A.4.13.3 The definitions in <i>NFPA 70(NEC)</i> and in this standard for <i>bonded (bonding)</i>, <i>grounded</i>, <i>grounding</i>, and <i>grounding electrode</i> are similar. The actual sections in the <i>NEC</i> and in this standard that define what constitutes these various items point to differences in application, equipment, and requirements. Section 250.50 of the <i>NEC</i> requires that all electrodes present at each building or structure be bonded together to form the grounding electrode system, which coordinates with the requirements of Section 4.13 of this standard. The differences occur in 250.52 of the <i>NEC</i>, which describes grounding electrode devices not shown in Section 4.12. Grounding electrode devices described in 250.52 of the <i>NEC</i> but not referenced in this document include the following: (1) 250.52(A)(1): 10 ft (3 m) of metallic underground water pipe that extends from the structure in contact with earth. (2) 250.52(A)(2): The <u>10 ft (3 m)</u> metal in-ground support structure <u>with or without concrete encasement</u> that is in contact with earth. (3) 250.52(A)(3)(2): The concrete-encased electrode described as #4 AWG, which would need to be a main-size conductor per 4.12.3.2. (4) 250.52(A)(4): The ground ring electrode not smaller than 2 AWG that is acceptable for Class I but would not be acceptable for Class II (see <i>Table 4.1.1.1.2</i>). (5) 250.52(A)(5): Pipe electrodes described in item (a), which are not included, and rod electrodes described in item (b) as zinc-coated steel, which are not covered (see 4.12.2.2). (6) 250.52(A)(6): Other listed electrodes, which would need to comply with the various paragraphs of Section 4.12. (7) 250.52(A)(7): Plate electrodes, which would need to comply with 4.12.6. (8) 250.52(A)(8): "Other local metal underground systems or structures," which are not referenced as grounding electrodes in this standard. The lightning protection system designer must be familiar with these differences to coordinate interconnection with other building grounding electrodes or the structural grounding electrode system as required by 4.13.3. Where separate but adjacent buildings or facilities are interconnected directly (not through a utility) by electric, CATV, CCTV, data, or communications wiring, the grounding systems of those buildings should be directly interconnected with a main-size conductor. The need for this interconnection can be eliminated with the use of fiber-optic cable, shielded wire, wire run in grounded metallic conduit, or cascading surge protection [surge arresters, surge protective devices (SPDs), or surge protectors installed at the entrance(s) and exit(s) of buildings or facilities].		
Statement (technical reason for FR)	The text is revised for consistency with the NEC and that the interconnections could be minimized as opposed to eliminated.		
Response (technical reason for not making some changes or for resolving)			

First Revision Text (FR)	A.4.13.3 The definitions in <i>NFPA 70(NEC)</i> and in this standard for <i>bonded (bonding)</i>, <i>grounded</i>, <i>grounding</i>, and <i>grounding electrode</i> are similar. The actual sections in the <i>NEC</i> and in this standard that define what constitutes these various items point to differences in application, equipment, and requirements. Section 250.50 of the <i>NEC</i> requires that all electrodes present at each building or structure be bonded together to form the grounding electrode system, which coordinates with the requirements of Section 4.13 of this standard. The differences occur in 250.52 of the <i>NEC</i>, which describes grounding electrode devices not shown in Section 4.12. Grounding electrode devices described in 250.52 of the <i>NEC</i> but not referenced in this document include the following: 1. 250.52(A)(1): 10 ft (3 m) of metallic underground water pipe that extends from the structure in contact with earth. 2. 250.52(A)(2): The 10 ft (3 m) metal in-ground support structure with or without concrete encasement that is in contact with earth. 3. 250.52(A)(3)(2): The concrete-encased electrode described as #4 AWG, which would need to be a main-size conductor per 4.12.3.2. 4. 250.52(A)(4): The ground ring electrode not smaller than 2 AWG that is acceptable for Class I but would not be acceptable for Class II (see <i>Table 4.1.1.1.2</i>). 5. 250.52(A)(5): Pipe electrodes described in item (a), which are not included, and rod electrodes described in item (b) as zinc-coated steel, which are not covered (see 4.12.2.2). 6. 250.52(A)(6): Other listed electrodes, which would need to comply with the various paragraphs of Section 4.12. 7. 250.52(A)(7): Plate electrodes, which would need to comply with 4.12.6. 8. 250.52(A)(8): “Other local metal underground systems or structures,” which are not referenced as grounding electrodes in this standard. The lightning protection system designer must be familiar with these differences to coordinate interconnection with other building grounding electrodes or the structural grounding electrode system as required by 4.13.3. Where separate but adjacent buildings or facilities are interconnected directly (not through a utility) by electric, CATV, CCTV, data, or communications wiring, the grounding systems of those buildings should be directly interconnected with a main-size conductor. The need for this interconnection can be minimized eliminated with the use of fiber-optic cable, shielded wire, wire run in grounded metallic conduit, or cascading surge protection [surge arresters, surge protective devices (SPDs), or surge protectors installed at the entrance(s) and exit(s) of buildings or facilities].
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Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.13.6.1	107	None	☐ Create First Revision ☒ Resolve

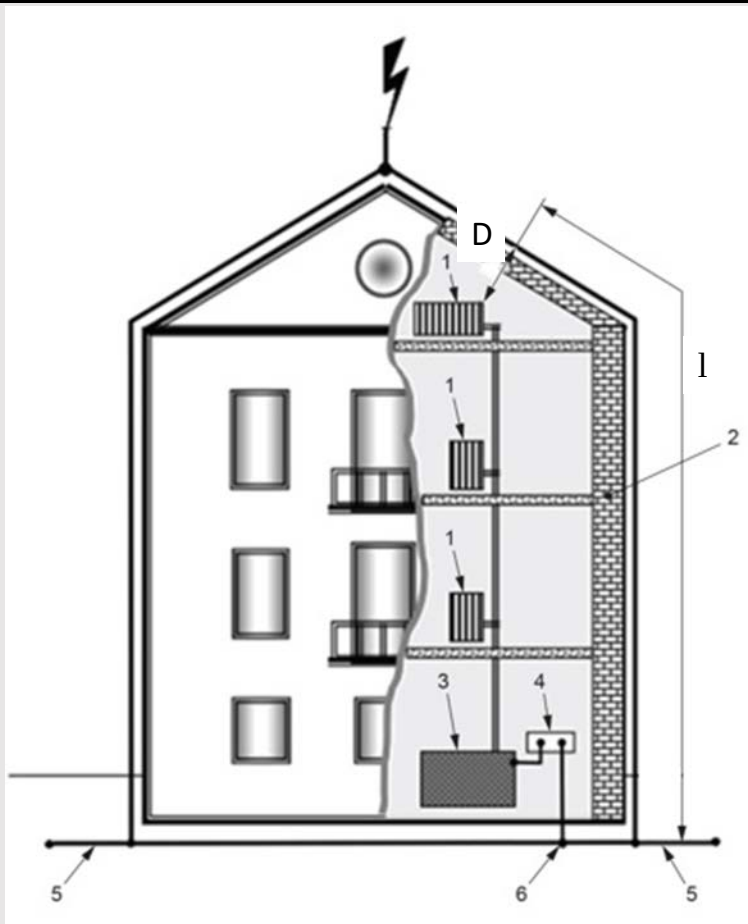
Proposed Text (PI)	4.13.6.1 Where bonding of the lightning protection grounding system, grounded media, and buried metallic conductors has not been accomplished at a common point, interconnection shall be provided according to the following: (1) Grounded media and buried metallic conductors shall be bonded to the lightning protection grounding system below a height 12 ft (3.6 m) vertically above the base of the structure. (2) *Where grounded media and buried metallic conductors are inherently bonded through construction to the lightning protection grounding system, additional bonding shall be permitted but is not required. (3) The continuous metal framework of a structure shall be connected to the lightning protection system (<i>see 4.8.13 and Section 4.18</i>). (4) Main-size lightning conductors shall be used for direct connection of grounded media and buried metallic conductors to the lightning protection system. (5) A continuous metal water pipe system providing interconnection of building grounded systems shall be connected to the lightning protection system. (6) *Interconnection to a gas line shall be made on the customer's side of the meter.
First Revision Text (FR)	4.13.6.1 Where bonding of the lightning protection grounding system, grounded media, and buried metallic conductors has not been accomplished at a common point, interconnection shall be provided according to the following: 1. Grounded media and buried metallic conductors shall be bonded to the lightning protection grounding system below a height 12 ft (3.6 m) vertically above the base of the structure. 2. *Where grounded media and buried metallic conductors are inherently bonded through construction to the lightning protection grounding system, additional bonding shall be permitted but not required. 3. The continuous metal framework of a structure shall be connected to the lightning protection system (<i>see 4.8.13 and Section 4.18</i>). 4. Main-size lightning conductors shall be used for direct connection of grounded media and buried metallic conductors to the lightning protection system. 5. A continuous metal water pipe system providing interconnection of building grounded systems shall be connected to the lightning protection system. 6. *Interconnection to a gas line shall be made on the customer's side of the meter.

Statement (technical reason for FR)	
Response (technical reason for not making some changes or for resolving)	The addition of 'is' in the text is not necessary.

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New 4.15.2.5	93	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	4.15.2.5 An electrically insulated lightning protection system may be employed to provide the separation distance required in 4.15.2.4.		
First Revision Text (FR)	To create a FR, revise text above or paste final version here.		
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	No limits, specifications, use of listed components, etc., exist for electrically insulated lightning protection system components. The proposed text is insufficient to provide guidance for implementing electrical insulation for modifying the separation distance expressed in 4.15.2.4.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.15.2.5.1	109	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	4.15.2.5.1 <u>Dangerous sideflash between components of the lightning protection system and grounded metal bodies can be prevented by providing a separation distance, s, between the parts. The general equation for the calculation of s is given by the following formula:</u> [Insert sideflash - separation calculation formula from IEC 62305-3, Clause 6.3.2 (simplified procedure)] [4.15.2.5.1] where: <u>s</u> = calculated <u>separation</u> distance <u>l</u> = vertical distance between the bond under consideration and the nearest interconnection to the lightning protection system or ground		

	n = value related to the number of down conductors that are spaced at least 25 ft (7.6 m) apart, located within a zone of 100 ft (30 m) from the bond in question and where bonding is required within 60 ft (18 m) from the top of any structure K_m = 1 if the flashover is through air; 0.50 if through dense material such as concrete, brick, wood, and so forth $K_f \equiv 0.04$ $K_c \equiv 1 / n$
First Revision Text (FR)	4.15.2.5.1 Grounded metal bodies shall be bonded to the lightning protection system where located within a calculated bonding distance, D, as determined by the following formula: $D = \frac{h}{6n} \times K_m$ $D = \frac{l}{6n} \times K_m$ [4.15.2.5.1] where: D = calculated bonding distance h = vertical distance between the bond under consideration and the nearest interconnection to the lightning protection system or ground <u>l = length between the point on the conductor under consideration from the bond in question to the grounding electrode or to the nearest intermediate level equipotential bonding point (4.14.3).</u> n = value related to the number of down conductors that are spaced at least 25 ft (7.6 m) apart, located within a zone of 100 ft (30 m) from the bond in question and where bonding is required within 60 ft (18 m) from the top of any structure. K_m = 1 if the flashover is through air; 0.50 if through dense material such as concrete, brick, wood, and so forth A.4.15.2.5.1 Figure A.4.15.2.5.1 Illustration of Bonding Distance.



Where:

D = calculated bonding distance

l = length between the point on the conductor under consideration from the bond in question to the grounding electrode or to the nearest intermediate level equipotential bonding point.

1: Grounded metal object.

2: Building fabric.

3: Grounded metal object.

4: Bond to earth grounding system.

5: Earth Grounding Electrode System

6: Grounding Electrode Conductor

This formula came from the same origin as the current IEC 62305-3 separation distance until the publication of the IEC 62305 series. At that point, the IEC incorporated additional K-factors into the equation that was IEC-specific based on work by Zischank of University of Armed Forces, Munich published in 1988. Zischank's work focused on IEC 62305-based designs and assumed height and

	down conductor separation values to be in the range of 3 m to 20 m. In contrast, this standard allows down conductor spacing out to 100 ft (30 m). Ki values are given specific to IEC Lightning Protection Levels, which relate to air termination zones of protection and down conductor spacings. It is not yet clear how Zischank's work extrapolates to 30 meter spacing and it would not be prudent to be changing formulas before the effect on system performance 4.15.2.5.2 The value n shall be calculated as follows: n = 1 where there is only one down conductor in this zone; n = 1.5 where there are only two down conductors in this zone; n = 2.25 where there are three or more down conductors in this zone.
Statement (technical reason for FR)	Sideflash voltage is influenced by the impedance of the total distance between the point of consideration and the grounding point or the closest equipotential bonding point. Annex material has been added to point out the similarities between the standards and reasons for the differences.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.15.2.6.1	110	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	4.15.2.6.1 Dangerous sideflash between components of the lightning protection system and grounded metal bodies can be prevented by providing a separation distance, s, between the parts. The general equation for the calculation of s is given by the following formula: [Insert sideflash - separation calculation formula from IEC 62305-3, Clause 6.3.2 (simplified procedure)] [4.15.2.6.1] where: s = calculated separation distance l = vertical distance between the bond under consideration and the nearest interconnection to the lightning protection system or ground n = value related to the number of down conductors that are spaced at least 25 ft (7.6 m) apart located within a zone of 100 ft (30 m) from the bond in question. K_m = 1 if the flashover is through air; 0.50 if through dense material such as concrete, brick, wood, and so forth K_i = 0.04		

	$K_c = 1/n$
First Revision Text (FR)	
First Revision Text (FR)	4.15.2.6.1 Grounded metal bodies shall be bonded to the lightning protection system where located within a calculated bonding distance, D, as determined by the following formula: $D = \frac{h}{6n} \times K_m$ $D = \frac{l}{6n} \times K_m$ [4.15.2.6.1] where: D = calculated bonding distance h = either the height of the building or the vertical distance from the nearest bonding connection from the grounded metal body to the lightning protection system and the point on the down conductor where the bonding connection is being considered <u>l = length between the point on the conductor under consideration from the bond in question to the grounding electrode or to the nearest intermediate level equipotential bonding point (4.14.3).</u> n = value related to the number of down conductors that are spaced at least 25 ft (7.6 m) apart and located within a zone of 100 ft (30 m) from the bond in question <u>and where bonding is required within 60 ft (18 m) from the top of any structure.</u> $K_m = 1$ if the flashover is through air; 0.50 if through dense material such as concrete, brick, wood, and so forth <u>A.4.15.2.6.1</u> <u>This formula came from the same origin as the current IEC 62305-3 separation distance until the publication of the IEC 62305 series. At that point, the IEC incorporated additional K-factors into the equation that was IEC-specific based on work by Zischank of University of Armed Forces, Munich published in 1988. Zischank's work focused on IEC 62305-based designs and assumed height and down conductor separation values to be in the range of 3 m to 20 m. In contrast, this standard allows down conductor spacing out to 100 ft (30 m). Ki values are given specific to IEC Lightning Protection Levels, which relate to air termination zones of protection and down conductor spacings. It is not yet clear how Zischank's work</u>

	extrapolates to 30 meter spacing and it would not be prudent to be changing formulas before the effect on system performance. 4.15.2.5.2 The value n shall be calculated as follows: n = 1 where there is only one down conductor in this zone; n = 1.5 where there are only two down conductors in this zone; n = 2.25 where there are three or more down conductors in this zone.
Statement (technical reason for FR)	Sideflash voltage is influenced by the impedance of the total distance between the point of consideration and the grounding point or the closest equipotential bonding point. Annex material has been added to point out the similarities between the standards and reasons for the differences.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.18.1	94	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	4.18.1 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 <u>0.064 (41.63 mm)</u> in thickness and is electrically continuous, or it is made electrically continuous by methods specified in 4.18.3.		
First Revision Text (FR)	4.18.1 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 4.18.3.		
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	The general requirement for structural LPS components should not be relaxed based on the exceptions in 4.8.3.2 (handrails & ladders) and 4.5.3.5 (masts). The proposed material specification creates a conflict with the general material specifications of 4.1.1 without additional specification with regard to cross-sectional area, resistance and other material properties.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.18.4.1	95	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	4.18.4.1 Grounding electrodes shall be connected to the structural metal framework at intervals around the perimeter averaging not more than <u>100 ft (30 m)</u> .		
First Revision Text (FR)	4.18.4.1 Grounding electrodes shall be connected to the structural metal framework at intervals around the perimeter averaging not more than 60 ft (18 m).		
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	There is insufficient technical substantiation to relax the existing requirements. The existing requirement is consistent with other standards (e.g. UL96A) and is consistent with construction methods with typical vertical frame spacing of 30 ft., grounding every other beam. Also accounted for in the existing language is the need to ground based on current division, where each beam in the metal framework down conductor system is effectively a current-carrying conductor.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New definition	10, 9	9 (Differently worded text added as 4.2.3)	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	Copper-Clad Steel Wire, 40% CCS The wire consists of a core of homogeneous steel with a continuous outer cladding of copper metallurgically bonded to the core throughout to have minimum copper thickness of 5% of the wire diameter.		
First Revision Text (FR)	<u>40% Copper-Clad Steel Wire (40% CCS)</u> <u>Wire consisting of a core of homogeneous steel with a continuous outer cladding of copper metallurgically bonded to the core. throughout to have minimum copper thickness of 9% of the wire diameter.</u>		
Statement (technical reason for FR)	This adds a definition for 40% CCS as a permitted wiring method for use in this standard when the material is in compliance with ASTM B 910 and B 227. A minimum copper thickness of 9% or the wire diameter equates to 40% copper cladding.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
TG 4	115	11	☐ Create First Revision ☐ Resolve
Proposed Text (PI)	4.1.1.1.1 Structures not exceeding 75 ft (23 m) in height shall be protected with Class I, Class II or Class III materials as shown in Table <u>Tables 4.1.1.1.1 and 4.1.1.1.2.</u>		
First Revision Text (FR)	See below for revised text.		
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)			

Table 4.1.1.1.1	All PIs used for FR or Resolve	Other PIs that propose revisions for this section		MOTION																																																																														
	11	115		☒ Create First Revision ☐ Resolve																																																																														
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	<table><thead><tr><th rowspan="2">Type of Conductor</th><th rowspan="2">Parameter</th><th colspan="2">Copper/<u>Copper Clad Steel</u></th><th colspan="2">Aluminum</th></tr><tr><th>US</th><th>SI</th><th>US</th><th>SI</th></tr></thead><tbody><tr><td>Air terminal, solid</td><td>Diameter</td><td>3/8 in.</td><td>9.5 mm</td><td>1/2 in.</td><td>12.7 mm</td></tr><tr><td>Air terminal, tubular</td><td>Diameter</td><td>5/8 in.</td><td>15.9 mm</td><td>5/8 in.</td><td>15.9 mm</td></tr><tr><td rowspan="4">Main conductor, cable</td><td>Wall thickness</td><td>0.033 in.</td><td>0.8 mm</td><td>0.064 in.</td><td>1.63 mm</td></tr><tr><td>Size each strand</td><td>17 AWG</td><td>1.04 mm²</td><td>14 AWG</td><td>2.08 mm²</td></tr><tr><td>Weight per length</td><td>187 lb/1000 ft</td><td>278 g/m</td><td>95 lb/1000 ft</td><td>141 g/m</td></tr><tr><td>Cross-section area</td><td>57,400 cir. Mils</td><td>29 mm²</td><td>98,600 cir. mils</td><td>50 mm²</td></tr><tr><td rowspan="2">Bonding conductor, cable (solid or stranded)</td><td>Size each strand</td><td>17 AWG</td><td>1.04 mm²</td><td>14 AWG</td><td>2.08 mm²</td></tr><tr><td>Cross-section area</td><td>26,240 cir. Mils</td><td>13.3 mm²</td><td>41,100 cir. mils</td><td>20.8 mm²</td></tr><tr><td rowspan="2">Bonding conductor, solid strip</td><td>Thickness</td><td>0.051 in.</td><td>1.30 mm</td><td>0.064 in.</td><td>1.63 mm</td></tr><tr><td>Width</td><td>1/2 in.</td><td>12.7 mm</td><td>1/2 in.</td><td>12.7 mm</td></tr><tr><td rowspan="2">Main conductor, solid strip</td><td>Thickness</td><td>0.051 in.</td><td>1.30 mm</td><td>0.064 in.</td><td>1.63 mm</td></tr><tr><td>Cross-section area</td><td>57,400 cir. Mils</td><td>29 mm²</td><td>98,600 cir. mils</td><td>50 mm²</td></tr></tbody></table>						Type of Conductor	Parameter	Copper/ <u>Copper Clad Steel</u>		Aluminum		US	SI	US	SI	Air terminal, solid	Diameter	3/8 in.	9.5 mm	1/2 in.	12.7 mm	Air terminal, tubular	Diameter	5/8 in.	15.9 mm	5/8 in.	15.9 mm	Main conductor, cable	Wall thickness	0.033 in.	0.8 mm	0.064 in.	1.63 mm	Size each strand	17 AWG	1.04 mm ²	14 AWG	2.08 mm ²	Weight per length	187 lb/1000 ft	278 g/m	95 lb/1000 ft	141 g/m	Cross-section area	57,400 cir. Mils	29 mm ²	98,600 cir. mils	50 mm ²	Bonding conductor, cable (solid or stranded)	Size each strand	17 AWG	1.04 mm ²	14 AWG	2.08 mm ²	Cross-section area	26,240 cir. Mils	13.3 mm ²	41,100 cir. mils	20.8 mm ²	Bonding conductor, solid strip	Thickness	0.051 in.	1.30 mm	0.064 in.	1.63 mm	Width	1/2 in.	12.7 mm	1/2 in.	12.7 mm	Main conductor, solid strip	Thickness	0.051 in.	1.30 mm	0.064 in.	1.63 mm	Cross-section area	57,400 cir. Mils	29 mm ²	98,600 cir. mils	50 mm ²
	Type of Conductor	Parameter	Copper/ <u>Copper Clad Steel</u>		Aluminum																																																																													
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First Revision Text (FR)	<u>Copper/40% CCS</u>																																																																																	
Statement (technical reason for FR)	This adds 40% CCS to the table along with copper (CU) as an acceptable alternative material type.																																																																																	
Response (technical reason for not making some changes or for resolving)																																																																																		

First Revision Text (FR)	4.1.1.1.1					
	Structures not exceeding 75 ft (23 m) in height shall be protected with Class I materials as shown in Table 4.1.1.1.1.					
	Table 4.1.1.1.1 Minimum Class I Material Requirements					
	Type of Conductor	Parameter	Copper/40% CCS		Aluminum	
			US	SI	US	SI
	Air terminal, solid	Diameter	3⁄8 in.	9.5 mm	1⁄2 in.	12.7 mm
	Air terminal, tubular	Diameter	5⁄8 in.	15.9 mm	5⁄8 in.	15.9 mm
	Main conductor, cable	Wall thickness	0.033 in.	0.8 mm	0.064 in.	1.63 mm
		Size each strand	17 AWG	1.04 mm ²	14 AWG	2.08 mm ²
		Weight per length	187 lb/1000 ft	278 g/m	95 lb/1000 ft	141 g/m
		Cross-section area	57,400 cir. Mils	29 mm ²	98,600 cir. mils	50 mm ²
		Size each strand	17 AWG	1.04 mm ²	14 AWG	2.08 mm ²
	Bonding conductor, cable (solid or stranded)	Cross-section area	26,240 cir. Mils	13.3 mm ²	41,100 cir. mils	20.8 mm ²
	Bonding conductor, solid strip	Thickness	0.051 in.	1.30 mm	0.064 in.	1.63 mm
		Width	1⁄2 in.	12.7 mm	1⁄2 in.	12.7 mm
	Main conductor, solid strip	Thickness	0.051 in.	1.30 mm	0.064 in.	1.63 mm
		Cross-section area	57,400 cir. Mils	29 mm ²	98,600 cir. mils	50 mm ²

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION				
A.4.1.1.1	34	None	☒ Create First Revision ☐ Resolve				
Proposed Text (PI)	A.4.1.1.1 Main-size lightning conductors are not manufactured to standard American Wire Gauge (AWG) sizes. Bare AWG conductors are not typically “listed for the purpose” for lightning protection by any listing authority. Table A.4.1.1.1 provides comparisons between lightning protection conductors and the closest AWG sizes from Table 8 in Chapter 9 of <i>NFPA 70</i>. Table A.4.1.1.1 Lightning Protection Conductors <table><tr><th>Lightning Conductor</th><th>Area</th></tr><tr><td>Class I main-size copper <u>or 40% copper-clad steel</u> lightning conductor</td><td>57,400 cir. mils</td></tr></table>			Lightning Conductor	Area	Class I main-size copper <u>or 40% copper-clad steel</u> lightning conductor	57,400 cir. mils
Lightning Conductor	Area						
Class I main-size copper <u>or 40% copper-clad steel</u> lightning conductor	57,400 cir. mils						

# 2 AWG	66,360 cir. mils
# 3 AWG	52,620 cir. mils
Class I main-size aluminum lightning conductor	98,600 cir. mils
# 1 AWG	83,690 cir. mils
# 1/0 AWG	105,600 cir. mils
Class II main-size copper or 40% copper-clad steel lightning conductor	115,000 cir. mils
# 1/0 AWG	105,600 cir. mils
# 2/0 AWG	133,100 cir. mils
Class II main-size aluminum lightning conductor	192,000 cir. mils
# 3/0 AWG	167,800 cir. mils
# 4/0 AWG	211,600 cir. mils
Lightning bonding conductor	-
Copper or 40% copper-clad steel	26,240 cir. mils
# 6 AWG	26,240 cir. mils
Lightning bonding conductor	-
Aluminum	41,100 cir. mils
# 4 AWG	41,740 cir. mils

First Revision Text (FR)	A.4.1.1.1 Main-size lightning conductors are not manufactured to standard American Wire Gauge (AWG) sizes. Bare AWG conductors are not typically “listed for the purpose” for lightning protection by any listing authority. Table A.4.1.1.1 provides comparisons between lightning protection conductors and the closest AWG sizes from Table 8 in Chapter 9 of NFPA 70. Table A.4.1.1.1 Lightning Protection Conductors <table><tr><th>Lightning Conductor</th><th>Area</th></tr><tr><td>Class I main-size copper <u>/ 40% CCS</u> lightning conductor</td><td>57,400 cir. Mils</td></tr><tr><td>#2 AWG</td><td>66,360 cir. Mils</td></tr><tr><td>#3 AWG</td><td>52,620 cir. Mils</td></tr><tr><td>Class I main-size aluminum lightning conductor</td><td>98,600 cir. Mils</td></tr><tr><td>#1 AWG</td><td>83,690 cir. Mils</td></tr><tr><td>#1/0 AWG</td><td>105,600 cir. Mils</td></tr><tr><td>Class II main-size copper <u>/ 40% CCS</u> lightning conductor</td><td>115,000 cir. Mils</td></tr><tr><td>#1/0 AWG</td><td>105,600 cir. Mils</td></tr><tr><td>#2/0 AWG</td><td>133,100 cir. Mils</td></tr><tr><td>Class II main-size aluminum lightning conductor</td><td>192,000 cir. Mils</td></tr><tr><td>#3/0 AWG</td><td>167,800 cir. Mils</td></tr><tr><td>#4/0 AWG</td><td>211,600 cir. Mils</td></tr><tr><td>Lightning bonding conductor</td><td></td></tr><tr><td>Copper <u>/ 40% CCS</u></td><td>26,240 cir. Mils</td></tr><tr><td>#6 AWG</td><td>26,240 cir. Mils</td></tr><tr><td>Lightning bonding conductor</td><td></td></tr><tr><td>Aluminum</td><td>41,100 cir. Mils</td></tr><tr><td>#4 AWG</td><td>41,740 cir. Mils</td></tr></table>	Lightning Conductor	Area	Class I main-size copper <u>/ 40% CCS</u> lightning conductor	57,400 cir. Mils	#2 AWG	66,360 cir. Mils	#3 AWG	52,620 cir. Mils	Class I main-size aluminum lightning conductor	98,600 cir. Mils	#1 AWG	83,690 cir. Mils	#1/0 AWG	105,600 cir. Mils	Class II main-size copper <u>/ 40% CCS</u> lightning conductor	115,000 cir. Mils	#1/0 AWG	105,600 cir. Mils	#2/0 AWG	133,100 cir. Mils	Class II main-size aluminum lightning conductor	192,000 cir. Mils	#3/0 AWG	167,800 cir. Mils	#4/0 AWG	211,600 cir. Mils	Lightning bonding conductor		Copper <u>/ 40% CCS</u>	26,240 cir. Mils	#6 AWG	26,240 cir. Mils	Lightning bonding conductor		Aluminum	41,100 cir. Mils	#4 AWG	41,740 cir. Mils
Lightning Conductor	Area																																						
Class I main-size copper <u>/ 40% CCS</u> lightning conductor	57,400 cir. Mils																																						
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#4 AWG	41,740 cir. Mils																																						
Statement (technical reason for FR)	This adds 40% CCS to the annex materials to correlate with the Table in 4.1.1.1.																																						
Response (technical reason for not making some changes or for resolving)																																							

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.1.1.1.2	12	48, 116	☒ Create First Revision ☐ Resolve

Proposed Text (PI)	4.1.1.1.2					
	Structures exceeding 75 ft (23 m) in height shall be protected with Class II materials as shown in Table 4.1.1.1.2.					
	Table 4.1.1.1.2 Minimum Class II Material Requirements					
	Type of Conductor	Parameter	Copper/ Copper Clad Steel		Aluminum	
			US	SI	US	SI
	Air terminal, solid	Diameter	1/2 in.	12.7 mm	5/8 in.	15.9 mm
	Main conductor, cable	Size each strand	15 AWG	1.65 mm ²	13 AWG	2.62 mm ²
		Weight per length	375 lb/1000 ft	558 g/m	190 lb/1000 ft	283 g/m
		Cross-section area	115,000 cir. mils	58 mm ²	192,000 cir. mils	97 mm ²
	Bonding conductor, cable (solid or stranded)	Size each strand	17 AWG	1.04 mm ²	14 AWG	2.08 mm ²
		Cross-section area	26,240 cir. mils	13.2 mm ²	41,100 cir. mils	20.8 mm ²
	Bonding conductor, solid strip	Thickness	0.051 in.	1.30 mm	0.064 in.	1.63 mm
		Width	1/2 in.	12.7 mm	1/2 in.	12.7 mm
Main conductor, solid strip	Thickness	0.064 in.	1.63 mm	0.1026 in.	2.61 mm	
	Cross-section area	115,000 cir. mils	58 mm ²	192,000 cir. mils	97 mm ²	
First Revision Text (FR)	. <u>Copper / 40% CCS</u>					
Statement (technical reason for FR)	This adds 40% CCS to the table with copper (CU) as an acceptable alternative material type. (A separate FR is recommended for PI 48 below)					
Response (technical reason for not making some changes or for resolving)						
	All PIs used for FR or Resolve	Other PIs that propose revisions for this section		MOTION		
	48	12, 116		☒ Create First Revision ☐ Resolve		
Proposed Text (PI)	4.1.1.1.2 Structures exceeding equal to or greater than 75 ft (23 m) in height shall be protected with Class II materials as shown in Table 4.1.1.1.2.					

First Revision Text (FR)	4.1.1.1.2 Structures exceeding <u>equal to or greater</u> than 75 ft (23 m) in height shall be protected with Class II materials as shown in Table 4.1.1.1.2.																													
Statement (technical reason for FR)	The current language in 4.1.1.1.1 and 4.1.1.1.2 excludes structures exactly 75 ft. This corrects that gap adding those structure heights to Class II materials. (A separate FR is recommended for PI-12 above)																													
Response (technical reason for not making some changes or for resolving)																														
TG 4	All PIs used for FR or Resolve	-Other PIs that propose revisions for this section	MOTION																											
	116	12, 48	☐ Create First Revision ☐ Resolve																											
Proposed Text (PI)	4.1.1.1.2— Structures exceeding 75 ft (23 m) in height shall be protected with Class II <u>or Class III</u> materials as shown in Table 4.1.1.1.2.																													
First Revision Text (FR)	See below for revised text.																													
Statement (technical reason for FR)																														
Response (technical reason for not making some changes or for resolving)																														
First Revision Text (FR)	4.1.1.1.2 Structures exceeding 75 ft (23 m) in height shall be protected with Class II materials as shown in Table 4.1.1.1.2. Table 4.1.1.1.2 Minimum Class II Material Requirements																													
<table><tr><th rowspan="2">Type of Conductor</th><th rowspan="2">Parameter</th><th colspan="2">Copper</th><th colspan="2">Aluminum</th></tr><tr><th>US</th><th>SI</th><th>US</th><th>SI</th></tr><tr><td>Air terminal, solid</td><td>Diameter</td><td>1/2 in.</td><td>12.7 mm</td><td>5/8 in.</td><td>15.9 mm</td></tr><tr><td rowspan="2">Main conductor, cable</td><td>Size each strand</td><td>15 AWG</td><td>1.65 mm²</td><td>13 AWG</td><td>2.62 mm²</td></tr><tr><td>Weight per length</td><td>375 lb/1000 ft</td><td>558 g/m</td><td>190 lb/1000 ft</td><td>283 g/m</td></tr></table>				Type of Conductor	Parameter	Copper		Aluminum		US	SI	US	SI	Air terminal, solid	Diameter	1/2 in.	12.7 mm	5/8 in.	15.9 mm	Main conductor, cable	Size each strand	15 AWG	1.65 mm ²	13 AWG	2.62 mm ²	Weight per length	375 lb/1000 ft	558 g/m	190 lb/1000 ft	283 g/m
Type of Conductor	Parameter	Copper				Aluminum																								
		US	SI	US	SI																									
Air terminal, solid	Diameter	1/2 in.	12.7 mm	5/8 in.	15.9 mm																									
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	Weight per length	375 lb/1000 ft	558 g/m	190 lb/1000 ft	283 g/m																									

		Cross-section area	115,000 cir. mils	58 mm ²	192,000 cir. mils	97 mm ²
	Bonding conductor, cable (solid or stranded)	Size each strand	17 AWG	1.04 mm ²	14 AWG	2.08 mm ²
		Cross-section area	26,240 cir. mils	13.2 mm ²	41,100 cir. mils	20.8 mm ²
	Bonding conductor, solid strip	Thickness	0.051 in.	1.30 mm	0.064 in.	1.63 mm
		Width	1/2 in.	12.7 mm	1/2 in.	12.7 mm
	Main conductor, solid strip	Thickness	0.064 in.	1.63 mm	0.1026 in.	2.61 mm
		Cross-section area	115,000 cir. mils	58 mm ²	192,000 cir. mils	97 mm ²

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.2.3	13	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	4.2.3 Copper <u>and copper-clad steel</u> lightning protection materials shall not be installed on or in contact with aluminum roofing, aluminum siding, or other aluminum surfaces.		
First Revision Text (FR)	4.2.3 Copper <u>and 40% CCS</u> lightning protection materials shall not be installed on or in contact with aluminum roofing, aluminum siding, or other aluminum surfaces.		
Statement (technical reason for FR)	This adds 40% CCS to the rule ensuring separation from aluminum as is required for copper.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other Pis that propose revisions for this section	MOTION
4.2.5	14	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	4.2.5* Lightning protection systems shall be designed to minimize the effects caused by runoff from both copper, <u>copper-clad steel</u> and aluminum lightning protection materials to prevent the		

	deterioration of incompatible materials and minimize the degradation of building aesthetics caused by staining.
First Revision Text (FR)	4.2.5* Lightning protection systems shall be designed to minimize the effects caused by runoff from both copper, 40% CCS, and aluminum lightning protection materials to prevent the deterioration of incompatible materials and minimize the degradation of building aesthetics caused by staining. A.4.2.5 Aluminum, and copper, and 40% CCS on any structure must be designed and installed to ensure compatibility such that the expected lifecycle for any given component can be realized. The AHJ or building owner must have a thorough understanding of these compatibility issues.
Statement (technical reason for FR)	This adds 40% CCS to the section and Annex material as it is an acceptable material along with CU and AL.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.3.2	15	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	4.3.2 Copper <u>or copper-clad</u> components installed within 24 in. (600 mm) of the top of a chimney or vent emitting corrosive gases shall be protected by a hot-dipped lead or tin coating.		
First Revision Text (FR)	4.3.2 Copper <u>or 40% CCS</u> components installed within 24 in. (600 mm) of the top of a chimney or vent emitting corrosive gases shall be protected by a hot-dipped lead or tin coating.		
Statement (technical reason for FR)	This ensures both CU and 40% CCS are properly protected from chimney or vent emitting corrosive gases.		
Response (technical reason for not making some			

changes or for resolving)	
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Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.3.4.2	16	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	4.3.4.2 Bimetallic connectors and fittings shall be used for splicing or bonding dissimilar metals. <u>Informational Note: Copper-clad still is dissimilar to aluminum, and not dissimilar to copper.</u>		
First Revision Text (FR)	4.3.4.2 Bimetallic connectors and fittings shall be used for splicing or bonding dissimilar metals.		
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	This would add information that is unnecessary for proper application of the rule.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.5.4.6	17	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	4.5.4.6 Connections between galvanized steel overhead ground wires and copper <u>or copper-clad steel</u> conductors shall be made through a suitable component that does not permit direct contact between the two materials.		
First Revision Text (FR)	4.5.4.6 Connections between galvanized steel overhead ground wires and copper <u>or 40% CCS</u> conductors shall be made through a suitable component that does not permit direct contact between the two materials.		
Statement (technical reason for FR)	The use of 40% CCS would have the same corrosive concerns as copper conductors have so needs to be added to this rule.		

Response (technical reason for not making some changes or for resolving)	
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Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
4.12.3.2	18	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	4.12.3.2* The concrete-encased electrode shall consist of one of the following: (1) Not less than 20 ft (6 m) of bare copper <u>or copper-clad steel</u> main-size conductor (2) At least 20 ft (6 m) of one or more bare or electrically conductive coated steel reinforcing bars or rods not less than 1/2 in. (12.7 mm) in diameter that have been effectively bonded together by welding, structural mechanical coupling, or overlapping 20 diameters and wire tying		
First Revision Text (FR)	4.12.3.2* The concrete-encased electrode shall consist of one of the following: 1. Not less than 20 ft (6 m) of bare copper <u>or 40% CCS</u> main-size conductor 2. At least 20 ft (6 m) of one or more bare or electrically conductive coated steel reinforcing bars or rods not less than 1/2 in. (12.7 mm) in diameter that have been effectively bonded together by welding, structural mechanical coupling, or overlapping 20 diameters and wire tying A.4.12.3.2 Field experience has demonstrated that a copper <u>or 40% CCS</u> conductor could experience accelerated corrosion at the point where the copper <u>or 40% CCS</u> conductor exits the concrete. Concrete and soil composition could have a direct impact on the amount of corrosion, if any. Investigation of existing installations at the proposed site or chemical analysis of the concrete and soil composition would provide a basis to determine if additional corrosion protection is warranted. Each installation should be evaluated to determine the need for any additional corrosion protection. Tinned copper <u>or 40% CCS</u> conductors or installation of a nonmetallic sleeve over the conductor where the conductor exits the concrete are two methods that could mitigate corrosion. The nonmetallic sleeve should extend 6 in. (150 mm) on each side of the transition from concrete to soil. See Sections 4.2 and 4.3 for additional requirements.		

Statement (technical reason for FR)	40% CCS is added to the section as the criteria for a copper concrete-encased electrode is the same for 40% CCS.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New 4.12.4.3	19	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	4.12.4.3 40% Copper-Clad Steel for Grounding Ring Electrode. Conductor material type 40% copper-clad steel may be used as a ground ring electrode		
First Revision Text (FR)	To create a FR, revise text above or paste final version here.		
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	The proposed section is not needed as permitted conductor materials for the ground ring electrode are provided elsewhere in the standard.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
6.2.2	20	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	6.2.2 Corrosion Protection. Copper, <u>copper-clad steel</u> and bronze materials used on the upper 25 ft (7.6 m) of a stack shall have a continuous covering of lead having a minimum thickness of 0.064 in. (1.63 mm) to resist corrosion by flue gases.		
First Revision Text (FR)	6.2.2 Corrosion Protection. Copper, <u>40% CCS</u> , and bronze materials used on the upper 25 ft (7.6 m) of a stack shall have a continuous covering of lead having a minimum thickness of 0.064 in. (1.63 mm) to resist corrosion by flue gases.		

Statement (technical reason for FR)	40% CCS is added to the section to ensure the material is effectively protected the same as copper and bronze materials.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
6.4.1.1	21	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	6.4.1.1 Conductors shall be copper or copper-clad steel, weighing not less than 375 lb per 1000 ft (558 g per m) without the lead coating, or approved corrosion-resistant material or coating.		
First Revision Text (FR)	6.4.1.1 Conductors shall be copper or 40% CCS, weighing not less than 375 lb per 1000 ft (558 g per m) without the lead coating, or approved corrosion-resistant material or coating.		
Statement (technical reason for FR)	This adds a requirement that 40% CCS conductors used for this application also meet the weight per 1,000 ft. criteria established for copper. (The task group is not certain this rule is needed as this weight metric is not readily verifiable by users of the standard and a performance factor in UL 96)		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
8.4.2.4	22	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	8.4.2.4* Ground ring electrodes shall be bare 40% copper or copper-clad steel conductors meeting or exceeding 105,000 circular mils.		

First Revision Text (FR)	8.4.2.4* Ground ring electrodes shall be bare copper <u>or 40% CCS</u> conductors meeting or exceeding 105<u>115</u>,000 circular mils. A.8.4.2.4 A conductor with a cross-sectional area of 105<u>115</u>,000 circular mils ensures that cables can remain serviceable over the lifecycle of the system.
Statement (technical reason for FR)	This adds 40% CCS to the rule and increases the circular mil to 115,000 to revert back to sizing of Class II materials as defined in 2020 edition.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
10.2.2.1	23	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	10.2.2.1 Copper <u>and 40% copper-clad steel</u> conductors shall be tinned.		
First Revision Text (FR)	10.2.2.1 Copper <u>and 40% CCS</u> conductors shall be tinned.		
Statement (technical reason for FR)	This adds 40% CCS to the rule as an equivalency for the needed protection of copper conductors.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
10.2.2.2	24	None	☐ Create First Revision ☒ Resolve

Proposed Text (PI)	10.2.2.2 All copper <u>and 40% copper-clad steel</u> conductors shall be of the grade required for commercial electrical work <u>and shall have at least 95 percent of the conductivity of pure copper.</u>
First Revision Text (FR)	10.2.2.2 All copper conductors shall be of the grade required for commercial electrical work and shall have at least 95 percent of the conductivity of pure copper.
Statement (technical reason for FR)	
Response (technical reason for not making some changes or for resolving)	The requirements in this section only apply to copper and not suitable for 40% CCS. (The task group is not certain this rule is needed as this weight metric is not readily verifiable by users of the standard and a performance factor in UL 96)

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
10.2.2.3	25	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	10.2.2.3 The use of conducting materials other than copper, such as <u>40% copper-clad steel</u> , aluminum, stainless steel, and bronze, shall be permitted, provided they meet all requirements in this chapter.		
First Revision Text (FR)	10.2.2.3 The use of conducting materials other than copper, such as <u>40% CCS</u> , aluminum, stainless steel, and bronze, shall be permitted, provided they meet all requirements in this chapter.		
Statement (technical reason for FR)	The allowance of 40% CCS should also be required to comply with the provisions of this chapter along with the other listed material types.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
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10.4.1.1	26	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	10.4.1.1* A main conductor made of copper <u>or 40% copper-clad steel</u> shall have a cross-sectional area of at least 0.033 in. ² (21 mm ²).		
First Revision Text (FR)	10.4.1.1* A main conductor made of copper <u>or 40% CCS</u> shall have a cross-sectional area of at least 0.033 in. ² (21 mm ²). A.10.4.1.1 See Table 9.12.5(a) of NFPA 302 for minimum strand sizes for watercraft conductors. Main conductors of greater cross-sectional area as discussed in Section 4.8 provide a greater degree of safety.		
Statement (technical reason for FR)	40% CCS is added to this section to ensure it is sized equivalent to copper when used as a main conductor.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
10.4.2.1	27	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	10.4.2.1 A bonding conductor made of copper <u>or 40% copper-clad steel</u> shall have a cross-sectional area of at least 0.013 in. ² (8.3 mm ²).		
First Revision Text (FR)	10.4.2.1 A bonding conductor made of copper <u>or 40% CCS</u> shall have a cross-sectional area of at least 0.013 in. ² (8.3 mm ²).		
Statement (technical reason for FR)	40% CCS is added to this section to ensure it is sized equivalent to copper when used as a bonding conductor.		
Response (technical reason for not making some			

changes or for resolving)	
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Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
10.4.5.2.1	28	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	10.4.5.2.1 The minimum contact area for a connection in a main conductor shall be given by 10.4.1.1 (for copper <u>or 40% copper-clad steel</u>), 10.4.1.2 (for aluminum), or 10.4.1.3 (for other metals).		
First Revision Text (FR)	10.4.5.2.1 The minimum contact area for a connection in a main conductor shall be given by 10.4.1.1 (for copper <u>or 40% CCS</u>), 10.4.1.2 (for aluminum), or 10.4.1.3 (for other metals).		
Statement (technical reason for FR)	This adds 40% CCS to align with similar action taken in 10.4.1.1.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
11.4.1.1	29	77	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	11.4.1.1* The counterpoise conductor shall be a bare, annealed, or soft drawn, solid copper <u>or 40% copper-clad steel</u> conductor not smaller than 6 AWG.		
First Revision Text (FR)	11.4.1.1* The counterpoise conductor shall be a bare, annealed, or soft drawn, solid copper or <u>40% CCS</u> conductor not smaller than 6 AWG.		
Statement (technical reason for FR)	This adds 40% CCS as an alternative to copper for the counterpoise conductor.		
Response (technical reason for			

not making some changes or for resolving)			
A.11.4.1.1	77	29	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	A.11.4.1.1 The copper counterpoise conductor size should be determined by the Engineer of Record based upon sound engineering practices. A 2 AWG bare, solid copper counterpoise conductor is recommended. The following factors should be evaluated when considering a larger size counterpoise conductor: (1) The airport's ability to maintain airport operations after an airfield lighting circuit or system failure (2) Accessibility of the copper counterpoise conductor for testing or repair (e.g., if the counterpoise conductor is installed in or under pavement) (3) Availability of qualified persons to perform airfield lighting system repairs (4) Life cycle cost of the larger size counterpoise conductor, including consideration of counterpoise conductor replacement prior to the end of an expected 20-year life (5) Results of a lightning risk assessment performed in accordance with Annex L (6) Past performance of the airfield lighting counterpoise system at the airport or geographic area The AHJ can determine and approve the size of the copper counterpoise conductor. <u>A #2 AWG solid copper conductor is 66,360 CM. The #2 AWG is a few thousand circular mils larger than the required Class I conductor (57,400 CM). However a #2 AWG is the smallest standard size AWG conductor that complies with the NFPA 780 Class I requirements (#4 AWG = 41,740 CM, #3 AWG = 52,620 CM).</u>		
First Revision Text (FR)	A.11.4.1.1 The copper counterpoise conductor size should be determined by the Engineer of Record based upon sound engineering practices. A 2 AWG bare, solid copper counterpoise conductor is recommended. The following factors should be evaluated when considering a larger size counterpoise conductor: 1. The airport's ability to maintain airport operations after an airfield lighting circuit or system failure 2. Accessibility of the copper counterpoise conductor for testing or repair (e.g., if the counterpoise conductor is installed in or under pavement) 3. Availability of qualified persons to perform airfield lighting system repairs 4. Life cycle cost of the larger size counterpoise conductor, including consideration of counterpoise conductor replacement prior to the end of an expected 20-year life		

	5. Results of a lightning risk assessment performed in accordance with Annex L 6. Past performance of the airfield lighting counterpoise system at the airport or geographic area The AHJ can determine and approve the size of the copper counterpoise conductor. <u>A #2 AWG solid copper conductor is 66,360 CM. The #2 AWG is a few thousand circular mils larger than the required Class I conductor (57,400 CM). However, a #2 AWG is the smallest standard size AWG conductor that complies with the NFPA 780 Class I requirements (#4 AWG = 41,740 CM, #3 AWG = 52,620 CM).</u>
Statement (technical reason for FR)	This annex material provides the user of the standard some guidance and rationale for upsizing the conductor.
Response (technical reason for not making some changes or for resolving)	

Commented [CC1]: I must be missing something. 57 kCm is required so this tells that a #2 is larger and that even though it is larger it is the closest standard size that meets the requirement. Then it explains that a #3 and #4 are too small.

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
11.4.1.2	30	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	11.4.1.2* In locations where bare copper <u>or 40% copper-clad steel counterpoise</u> conductors will be adversely affected by the environment, corrosion-resistant materials (e.g., tinned copper, stainless steel) as permitted by the AHJ shall be utilized.		
First Revision Text (FR)	11.4.1.2* In locations where bare copper <u>or 40% CCS</u> counterpoise conductors will be adversely affected by the environment, corrosion-resistant materials (e.g., tinned copper, stainless steel) as permitted by the AHJ shall be utilized. A.11.4.1.2 Corrosion, oxidation, chemical reaction, and electrolysis can all be considered adverse effects on a bare copper <u>or 40% CCS</u> counterpoise conductor. Most metals are subject to some form of corrosion, oxidation, chemical reaction, or electrolysis. Where the history of grounding systems (buried conductors, buried metallic objects) in the area is not known, a soil resistivity and soil pH profile in		

	conjunction with the consultation of a materials/corrosion specialist could be necessary to properly design the grounding system. If stainless steel is to be used it should be a minimum of 154,000 CM (78 mm ²) corresponding to approximately 3/8 in. (9.5 mm) diameter.
Statement (technical reason for FR)	This adds 40% CCS to the section and annex materials to ensure equivalent corrosion protection is provided.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
11.4.2.5	31	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	11.4.2.5 Reinforcing steel, where used as part of the light base installation, shall be bonded to the metallic light base using a minimum 6 AWG bare solid copper <u>or 40% copper-clad steel conductor</u> .		
First Revision Text (FR)	11.4.2.5 Reinforcing steel, where used as part of the light base installation, shall be bonded to the metallic light base using a minimum 6 AWG bare solid copper <u>or 40% CCS conductor</u> .		
Statement (technical reason for FR)	This adds 40% CCS as an alternative to copper for this application.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
11.4.2.6.2.2	32	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	11.4.2.6.2.2* Each light base or mounting stake shall be provided with a grounding electrode in accordance with one of the following methods:		

	(1) Where a metallic light base is used, the grounding electrode shall be bonded to the metallic light base or mounting stake with a minimum 6 AWG bare, annealed, or soft drawn, solid copper <u>or 40% copper-clad steel</u> conductor. (2) Where a nonmetallic light base is used, the grounding electrode shall be bonded to the metallic light fixture or metallic base plate with a minimum 6 AWG bare, annealed, or soft drawn, solid copper <u>or 40% copper-clad steel</u> conductor.
First Revision Text (FR)	11.4.2.6.2.2* Each light base or mounting stake shall be provided with a grounding electrode in accordance with one of the following methods: 1. Where a metallic light base is used, the grounding electrode shall be bonded to the metallic light base or mounting stake with a minimum 6 AWG bare, annealed, or soft drawn, solid copper <u>or 40% CCS</u> conductor. 2. Where a nonmetallic light base is used, the grounding electrode shall be bonded to the metallic light fixture or metallic base plate with a minimum 6 AWG bare, annealed, or soft drawn, solid copper <u>or 40% CCS</u> conductor. A.11.4.2.6.2.2 The light base grounding electrode can be installed in the same excavation as the light base or mounting stake. If a ground rod is used as the light base grounding electrode, the ground rod can be installed exterior to the light base or installed within the light base through a hole provided by the manufacturer in the bottom of the light base.
Statement (technical reason for FR)	This adds 40% CCS as an alternative to copper for this application.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
11.4.6	33	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	11.4.6 Bonding Jumpers. A minimum 6 AWG stranded copper <u>or 40% copper-clad steel</u> green insulated bonding jumper shall be installed between the following items:		

	(1) In-pavement airfield lighting fixture and the metallic light base (2) Elevated fixture base plate and metallic light base (3) Surge arresters and metallic light base
First Revision Text (FR)	11.4.6 Bonding Jumpers. A minimum 6 AWG stranded copper <u>or 40% CCS</u> green insulated bonding jumper shall be installed between the following items: 1. In-pavement airfield lighting fixture and the metallic light base 2. Elevated fixture base plate and metallic light base 3. Surge arresters and metallic light base
Statement (technical reason for FR)	This adds 40% CCS as an alternative to copper for this application.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
B.2.3	123	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	B.2.3 Metal parts of a structure can be used as part of the lightning protection system in some cases. For example, the structural metal framing, which has sufficient cross-sectional area to equal the conductivity of main conductors, and which is electrically continuous, can be used in lieu of separate down conductors. In such cases, air terminals can be bonded to the framework at the top, and grounding electrodes can be provided at the bottom, as described elsewhere in this standard. Structures with $\frac{3}{16}$ in. (4.8 mm) thick, or thicker, <u>steel</u> metal shells or skins that are electrically continuous might not require a system of air terminals and down conductors.		
First Revision Text (FR)	B.2.3 Metal parts of a structure can be used as part of the lightning protection system in some cases. For example, the structural metal framing, which has sufficient cross-sectional area to equal the conductivity of main conductors, and which is electrically continuous, can be used in lieu of separate down conductors. In such cases, air terminals can be bonded to the framework at the top, and grounding electrodes can be provided at the bottom, as described elsewhere in this standard. Structures with $\frac{3}{16}$ in. (4.8 mm) thick, or thicker, <u>steel</u> metal shells or skins that are electrically continuous might not require a system of air terminals and down conductors.		
Statement (technical reason for FR)	Create FR – The language added clarifies the intent of the document for steel components that are part of the structure. TG added the word steel to PI to narrow the scope of this paragraph in Annex B that is covering “the Principles of Lightning Protection.”		
Response (technical reason for not making some changes or for resolving)	Existing Tables 4.1.1.1.1 and 4.1.1.1.2 cover the different acceptable metals and thicknesses.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
B.3.2.2	105	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	B.3.2.2 Rolling Sphere Method. The rolling sphere method was incorporated into NFPA 780 in the 1980 edition. It originated from the electric power transmission industry (lightning strike attachment to phase and shield wires of lines) and is based on the simple electrogeometric model. To apply the method, an imaginary sphere is rolled over the structure. All surface contact points are deemed to require protection,		

	while the unaffected surfaces and volumes are deemed to be protected, as shown in Figure B..2.2. The physical basis for the rolling sphere method is the electrogeometric model. Consider a particular peak lightning current I_p (kA) and the corresponding striking distance d_s (m), where $d_s = 10 I_p^{0.65}$. For a typical peak current of 10 kA, the striking distance is approximately 150 ft (45 m). This is the distance at which a downward leader results in the initiation of an upward leader from the structure. Figure B.3.2.2 Lightning Protection Design Using the Rolling Sphere Method. Note that a smaller striking distance (implying a lower peak current of the lightning event) results in a smaller sphere that can intrude upon the standard 150 ft (45 m) zone of protection. Thus, a more conservative design is to size the sphere using a lower lightning peak current. Lightning peak currents below 5 kA to 7 kA are not common. Ten kA peak current represents 91 percent of all lightning events. The advantage of the rolling sphere method is that it is relatively easy to apply, even to buildings with complicated shapes. However, since it is a simplification of the physical process of lightning attachment to a structure, it has some limitations. The main limitation is that it assigns an equal leader initiation ability to all contact points on the structure; no account is taken of the influence of electric fields in initiating return-streamers, so it does not distinguish between likely and unlikely lightning strike attachment points. In other words, for For a given prospective peak stroke current, the striking distance d_s is a <i>constant value</i>. This simplification stems from the RSM's origins in the electrical power transmission industry, where there is considerable uniformity in the parameters of transmission lines (diameters, heights, etc.). In reality, lightning could preferentially strike the corner of a building rather than the vertical flat surface halfway down the side of the building. The same claims apply to the flat roof of a structure. Some qualitative indication of the probability of strike attachment to any particular point can be obtained if the sphere is supposed to be rolled over the building in such a manner that its center moves at constant speed. Then the length of time that the sphere dwells on any point of the building gives a qualitative indication of the probability of that point being struck. Thus, for a simple rectangular building with a flat roof, the dwell time would be large at the corners and edges and small at any point on the flat part of the roof, correctly indicating a higher probability of the corners or edges being struck and a low probability that a point on the flat part of the roof will be struck. Where the RSM is applied to a building of height greater than the selected sphere radius, the sphere touches the vertical edges will touch vertical walls without protrusions on the sides of the building at all points above a height equal to the sphere radius. This indicates the possibility of strikes to the sides of the building and raises the question of the need for an air terminal network in these locations. Studies show that strikes to vertical edges on the sides of tall buildings do occur but are not very common. There are theoretical reasons for believing that only flashes with low I_p, and consequently low d_s, values are likely to be able to penetrate below the level of the roof of a building and strike the sides. Hence, the consequences of a strike to the sides of a building could result in damage of a minor nature. Unless there are specific reasons for side protection, as would could be the case of a structure containing explosives, it is considered that the cost of side protection would not normally be justified a lightning risk assessment may be justified to determine whether the risk in such areas justifies protection.
First Revision Text (FR)	
Statement (technical reason for FR)	The deleted paragraph is specific to a zone of protection software. This revision also makes some editorial changes.
Response (technical reason for	

not making some changes or for resolving)	
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Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
D.1.2	147	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	D.1.2 Visual Inspection. Visual inspections are made to ascertain the following: (1) The system is in good repair. (2) There are no loose connections that might result in high-resistance joints. (3) No part of the system has been weakened by corrosion or vibration. (4) All down conductors and grounding electrodes are intact (not severed). (5) All conductors and system components are fastened securely to their mounting surfaces and are protected against accidental mechanical displacement as required. (6) There have not been additions or alterations to the protected structure that would require additional protection. (7) There is no visual indication of damage to SPDs and confirm-status lights, where provided, <u>are still functioning</u>. (8) The system complies in all respects with the current edition of this standard.		
First Revision Text (FR)	D.1.2 Visual Inspection. Visual inspections are made to ascertain the following: 1. The system is in good repair. 2. There are no loose connections that might result in high-resistance joints. 3. No part of the system has been weakened by corrosion or vibration. 4. All down conductors and grounding electrodes are intact (not severed). 5. All conductors and system components are fastened securely to their mounting surfaces and are protected against accidental mechanical displacement as required. 6. There have not been additions or alterations to the protected structure that would require additional protection.		

	7. There is no visual indication of damage to SPDs and confirm-status lights, where provided, <u>are still functioning</u>. 8. The system complies in all respects with the current edition of this standard.
Statement (technical reason for FR)	The revision to Item 7 clarifies what specifically should be inspected on the SPD.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
7.1.1	101	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	7.1.1* This chapter shall apply to the protection of structures containing flammable vapors, flammable gases, or liquids that give off flammable vapors. <u>This Chapter does not address threats due to the electromagnetic effects of lightning, such as Lightning Electromagnetic Pulse (LEMP).</u>		
First Revision Text (FR)	7.1.1* This chapter shall apply to the protection of structures containing flammable vapors, flammable gases, or liquids that give off flammable vapors. A.7.1.1 This chapter applies to structures that might contain a Class I hazardous (classified) location in all or only portions of a structure. See Article 500 in NFPA 70 for information on classified locations. Sections 7.1 and 7.2 provide administrative information and a discussion on the general principles of the protection of structures containing flammable vapors, flammable gases, or liquids that give off flammable vapors. These are only general principles. Specific requirements for specific applications can be found in the sections that follow. Section 7.3 provides general protective measures and baseline requirements. These requirements apply to all structures except where specified otherwise for specific structures. It covers all the aspects of protection, but all the requirements might not apply to every structure. Section 7.4 contains requirements for specific classes of structures. Subsection 7.4.1 provides the requirements for operating facilities and other non-storage applications. Section 7.5 applies to storage tanks under pressure and Section 7.6 addresses aboveground tanks at atmospheric pressure. Section 7.7 addresses earthen containers at atmospheric pressure.		
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	The proposed text may imply that NFPA 780 does not consider the concerns associated with LEMP. Whereas, Chapter 7 does include a number of requirements for which LEMP is a consideration e.g. 7.1.2, 7.2.2, 7.3.5, 7.5, 7.6.2.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
7.1.2	142 (global)	None	☐ Create First Revision ☒ Resolve

Proposed Text (PI)	Committee should consider rewrite of 7.1.2 to include how to protect other structures or systems that include all flammable vapors. A task group might be beneficial to study the topic.
First Revision Text (FR)	7.1.2 This chapter shall not apply to the protection of nonmetallic tanks containing flammable vapors, flammable gases, or liquids that give off flammable vapors. (See Annex N.)
Statement (technical reason for FR)	
Response (technical reason for not making some changes or for resolving)	NFPA Regulation 4.3.4.1.C requires the proposed text to be included in the Public Input.

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New 7.1.2	143	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	7.1.2 This chapter shall not apply to the protection of structures that have utilization or production equipment with no containment vessels or tanks.		
First Revision Text (FR)	7.1.2 This chapter shall not apply to: 1) the protection of nonmetallic tanks containing flammable vapors, flammable gases, or liquids that give off flammable vapors. (See Annex N.) <u>2) the protection of structures that solely have utilization or production equipment.</u>		
Statement (technical reason for FR)	The first revision restructures 7.1.2 into a list form and clarifies that Chapter 7 also does not apply to structures that solely have utilization or production equipment, e.g. canopies over piping headers.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
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7.3.7.1	55	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	7.3.7.1 Except as specified in 7.3.7.2 and 7.3.7.3, a ground ring electrode or ground loop conductor supplemented by one or more grounding electrodes, as identified in 4.12.2 through 4.12.7, shall be provided for structures, <u>such as buildings and containers</u> , containing flammable vapors, flammable gases, or liquids that can give off flammable vapors. <u>This shall not apply to tanks and petroleum production, processing, and storage structures.</u>		
First Revision Text (FR)	7.3.7.1* Except as specified in 7.3.7.2 and 7.3.7.3, a ground ring electrode or ground loop conductor supplemented by one or more grounding electrodes, as identified in 4.12.2 through 4.12.7, shall be provided for structures containing flammable vapors, flammable gases, or liquids that can give off flammable vapors. <u>A.7.3.7.1</u> <u>Section 7.3.7.1 does not apply to tanks and petroleum production, processing, and storage structures.</u>		
Statement (technical reason for FR)	The addition of annex material indicates that 7.3.7.1 does not apply to tanks and petroleum production, processing, and storage structures.		
Response (technical reason for not making some changes or for resolving)	The information proposed is not necessary in the body of the standard.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
7.3.7.3	56	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	7.3.7.3 A metal tank shall be grounded using one or more of the following methods: (1) *The tank shall be connected without insulated joints to a grounded metallic piping system. (2) The vertical cylindrical, flat-bottom metal tank shall rest on the earth, <u>bitumen</u>, or concrete and shall be at least 20 ft (6 m) in diameter, or it shall rest on bituminous pavement and be at least 50 ft (15 m) in diameter. (3) The tank shall be grounded through a minimum of two grounding electrodes, as described in Section 4.12, at a maximum of 100 ft (30 m) intervals along the perimeter of the tank. (4) <u>The tank shall be grounded at a minimum of two locations along the perimeter of the tank to a site grounding system.</u>		

First Revision Text (FR)	<u>7.3.7.3*</u> A metal tank shall be grounded using one or more of the following methods: 1. *The tank shall be connected without insulated joints to a grounded metallic piping system. 2. The vertical, <u>cylindrical-flat-bottom metal</u> tank shall rest on the earth, <u>bitumen</u>, or concrete and shall be at least 20 ft (6 m) in diameter, or it shall rest on bituminous pavement and be at least 50 ft (15 m) in diameter. 3. The tank shall be grounded through a minimum of two grounding electrodes, as described in Section 4.12, at a maximum of 100 ft (30 m) intervals along the perimeter of the tank. 4. <u>The tank shall be grounded at a minimum of two locations along the perimeter of the tank to a site grounding system.</u> <u>A.7.3.7.3</u> <u>Where a tank is installed over an insulating membrane for environmental or other reasons the insulating membrane (containment barrier, etc.) has no effect on the choice of grounding methods noted in 7.3.7.3. The use of insulating membranes does not affect the lightning attachment process; however, it poses a threat to personal safety.</u> <u>Without the addition of supplemental grounding methods lightning strikes to the tank may pose a threat to the integrity of the membrane.</u>
Statement (technical reason for FR)	There is no known technical justification to maintain the minimum diameter requirement for the tanks within the methods recommended for grounding metal tanks provided in 7.3.7.3. The addition of item 4 introduces an alternative grounding method. The annex material is necessary on account the removal of 7.3.7.4 in the body of NFPA 780 which had addressed the use of insulating membranes.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
7.3.7.4	89	None	☒ Create First Revision ☐ Resolve

Proposed Text (PI)	7.3.7.4 Where a tank is installed over an insulating membrane for environmental or other reasons, it shall be grounded as described in 7.3.7.3 (1) or 7.3.7.3 (2), 7.3.7.3 (3), or 7.3.7.3.(4).
First Revision Text (FR)	7.3.7.4 Where a tank is installed over an insulating membrane for environmental or other reasons, it shall be grounded as described in 7.3.7.3(1) or 7.3.7.3(3).
Statement (technical reason for FR)	Relocating the topic of how to ground tanks installed upon insulating membranes to the annex as A.7.3.7.3 and relating to 7.3.7.3 on account of insulating membranes are considered to have no affect on the selection of a particular grounding method.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New 7.3.7.5	92	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	7.3.7.5 Additional grounding considerations Grounding for purposes other than lightning protection is not addressed or included in this section, but shall be considered by the owner/operator.		
First Revision Text (FR)	To create a FR, revise text above or paste final version here. 7.3.7.5 Additional grounding considerations Grounding as required by NFPA 780 shall only apply to lightning protection systems.		
Statement (technical reason for FR)	New Section 7.3.7.5 cautions that lightning protection grounding may not meet grounding requirements for other purposes.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
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7.4	90, 58 (same revision to 7.4.1)	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	7.4 Operating Facilities (Non -Storage Applications). 7.4.1* Structures containing hazardous (classified) locations used for non -storage applications shall comply with the requirements of Section 7.3 unless justified by a lightning risk assessment.	
First Revision Text (FR)	7.4 Operating Facilities (Non-Storage Applications). 7.4.1* Structures containing hazardous (classified) locations used for non-storage applications shall comply with the requirements of Section 7.3 unless justified by a lightning risk assessment. A.7.4.1 For structures in which a hazardous (classified) location exists in only one part of the structure, a risk assessment utilizing the lightning protection zone (LPZ) concept in accordance with IEC 62305-2, Protection Against Lightning — Part 2: Risk Management, is recommended. The lightning risk assessment provided in Annex L does not currently incorporate the concept of defining multiple LPZs in a structure, but the methodology for the assessment is given below. An LPZ is characterized by a common set of lightning risk components and not necessarily by walls or other physical barriers. LPZs are generally used to address risks related to a specific area(s) in or around a structure. They are associated with specific characteristics of susceptibility to lightning-related threats. A structure might be characterized as a single zone or it could be divided into multiple risk zones, where each risk zone is defined by a common set of relevant risk components. The advantage of using the LPZ concept can be seen where only a portion of a larger structure needs to meet the requirements of Chapter 7 and the cost of protecting the structure as a single zone would be greater than mitigating the risk in that zone. Dividing the structure into lightning protection zones enables each zone to be assessed individually to determine whether measures could be taken within that zone to reduce risk to a tolerable level and not require the measures to be implemented throughout the structure. In such cases, the characteristics of each zone in the structure must be evaluated, taking into account each risk component relevant to that zone. This enables the most suitable protection measures to be applied to each risk zone, tailoring the protection against lightning for specific applications.	
Statement (technical reason for FR)		
Response (technical reason for not making some changes or for resolving)	Section 7.4 addresses non-storage structures. Therefore the “non” should remain in 7.4 and 7.4.1.	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
7.6.2.1.1	59	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	7.6.2.1.1 Metallic primary shoe seals shall be electrically bonded to the floating roof either inherently — through design and construction — or by a minimum of one Class I lightning protection conductor or an equivalent at each end of each shoe.		
First Revision Text (FR)	7.6.2.1.1 Metallic primary shoe seals shall be electrically bonded to the floating roof either inherently — through design and construction — or by a minimum of one Class I lightning protection conductor or an equivalent at each end of each shoe.		
Statement (technical reason for FR)	Adequate bonding can be achieved by using only one bonding jumper.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
7.6.2.2	102	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	7.6.2.2* Fixed Contacts. 7.6.2.2.1 The tank's floating roof shall be bonded to the tank shell by a direct electrical connection using a bypass conductor with a minimum cross-sectional area equivalent to that of a main-size conductor. 7.6.2.2.2 Each conductor, including the connectors, shall have a maximum end-to-end electrical resistance of 0.03 ohm. 7.6.2.2.3 The bypass conductor shall be of the minimum length necessary to permit full movement of the floating roof. 7.6.2.2.4		

	Bypass conductors shall be installed as follows: (1) A minimum of two bypass conductors shall be installed. (2) Bypass conductors shall be installed for every 100 ft (30 m) of the tank perimeter or portion thereof. (3) Conductors shall be evenly spaced around the tank circumference. 7.6.2.2.5— Where there is a rolling ladder, one of the required bypass conductors shall be installed along and bonded to the rolling ladder. 7.6.2.2.6— The bypass conductor bonded to the rolling ladder shall be a continuous conductor bonded at one end to the floating roof and at the other end to the tank shell. 7.6.2.2.7*— The bypass conductors and terminations shall be positioned and of sufficient flexibility, cross-sectional area, and corrosion resistance to maximize service life.
First Revision Text (FR)	7.6.2.2* Fixed Contacts. A.7.6.2.2 Fixed contacts, such as bypass conductors, are used for conduction of the intermediate- and long-duration component of lightning-stroke current. 7.6.2.2.1 The tank's floating roof shall be bonded to the tank shell by a direct electrical connection using a bypass conductor with a minimum cross-sectional area equivalent to that of a main-size conductor. 7.6.2.2.2 Each conductor, including the connectors, shall have a maximum end-to-end electrical resistance of 0.03 ohm. 7.6.2.2.3 The bypass conductor shall be of the minimum length necessary to permit full movement of the floating roof. 7.6.2.2.4 Bypass conductors shall be installed as follows: 1. A minimum of two bypass conductors shall be installed. 2. Bypass conductors shall be installed for every 100 ft (30 m) of the tank perimeter or portion thereof. 3. Conductors shall be evenly spaced around the tank circumference. 7.6.2.2.5

	Where there is a rolling ladder, one of the required bypass conductors shall be installed along and bonded to the rolling ladder. 7.6.2.2.6 The bypass conductor bonded to the rolling ladder shall be a continuous conductor bonded at one end to the floating roof and at the other end to the tank shell. 7.6.2.2.7* The bypass conductors and terminations shall be positioned and of sufficient flexibility, cross-sectional area, and corrosion resistance to maximize service life. A.7.6.2.2.7 API RP 545, Recommended Practice for Lightning Protection of Aboveground Storage Tanks for Flammable or Combustible Liquids, recommends a minimum service life of 30 years.
Statement (technical reason for FR)	
Response (technical reason for not making some changes or for resolving)	Section 7.6.2.2 addressing fixed contacts was not removed from the standard as it provides valuable information to users of the standard.

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
7.8.4	60	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	7.8.4 Ground-level potential equalization shall be established within the tank battery through interconnection of metallic components, underground piping, and grounding systems.		
First Revision Text (FR)	7.8.4 Ground-level potential equalization shall be established within the tank battery through interconnection of metallic components, aboveground and underground metallic piping, and grounding systems.		
Statement (technical reason for FR)	Metallic piping needs to be bonded whether the piping is above the ground or buried below the ground. Piping above the ground provides the same bonding qualities as underground piping and therefore should be allowed.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
7.8.5	61	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	7.8.5* In locations where direct strikes or arcing is likely to occur, <u>operating techniques and engineering methods</u> shall be used to minimize the accumulation of flammable vapors in areas where a source of ignition is likely to be present.		
First Revision Text (FR)	7.8.5* In locations where direct strikes or arcing is likely to occur, <u>maintenance, operating and engineering techniques and</u> methods shall be used to minimize the accumulation of flammable vapors in areas where a source of ignition is likely to be present. A.7.8.5 A method of venting in locations where arcing is likely to occur is to install a vapor recovery system or, at a minimum, a horizontal vent line that terminates at least 50 ft (15.2 m) from the tank battery. All vents, flame arrestors, and thief hatches should be maintained in operating condition. All thief hatches should be closed during normal tank operations.		
Statement (technical reason for FR)	Operating and maintenance techniques in addition to proper engineering methods also help to minimize the accumulation of flammable vapors.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
8.2.2	99	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	8.2.2 Electromagnetic Coupling. Where the effects of electromagnetic coupling are of concern, a mast or overhead wire (catenary) system shall be installed see 8.3.2.		
First Revision Text (FR)	8.2.2 Electromagnetic Coupling. Where the effects of electromagnetic coupling are of concern, a mast or overhead wire (catenary) system shall be installed <u>(See also A.8.3.2).</u>		
Statement (technical reason for FR)	The need for the Faraday caged LPS is dependent on the sensitivity of the explosives operations conducted. In some cases, the separation is accomplished by the mast or catenary system is sufficient.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
8.3.2	100	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	8.3.2* Metallic (Faraday-Like) Cage. Where optimum protection for structures housing explosives is required, <u>such as protection from electromagnetic coupling or inducing potentials such as LEMP</u> (as determined by the AHJ), a grounded, continuously conductive enclosure <u>of adequate thickness</u> , as shown in Figure 8.3.2, shall be used.		
First Revision Text (FR)	8.3.2* Metallic (Faraday-Like) Cage. Where optimum protection for structures housing explosives is required, <u>such as protection from electromagnetic coupling or inducing potentials such as LEMP</u> (as determined by the AHJ), a grounded, continuously conductive enclosure <u>of adequate thickness</u> , as shown in Figure 8.3.2, shall be used. A.8.3.2 The best method to protect extremely sensitive operations from all sources of electromagnetic radiation is to enclose the operations or facility inside a metallic, "Faraday-like" cage. A metallic, Faraday-like cage is an enclosure that comprises a continuous grid of conductors, such that the voltage between any two points		

	inside the enclosure is zero when the cage is immersed in an electrostatic field. A metallic cage or Faraday shield lightning protection system is one in which the protected volume is enclosed by a heavy metal screen (i.e., similar to a birdcage) or continuous metallic structure with all metallic penetrations bonded. The lightning current flows on the exterior of the structure, not through the interior. A Faraday-like shield, which is not an ideal Faraday cage, is formed by a continuous conductive matrix that is properly bonded and grounded. A freestanding structure that is determined by the AHJ to be a metallic cage or Faraday-like shield might not require either grounding systems or strike termination devices. Use of a strike termination system on these structures provides a preferred attachment point for lightning and could prevent structural damage, such as concrete spall, from direct lightning attachment. The intent of this type of structure is to prevent the penetration of lightning current and related electromagnetic field into the object to be protected and prevent dangerous thermal and electrodynamic effects of current as well as dangerous sparking and overvoltages for electrical and electronic systems. Effective lightning protection is similarly provided by metallic structures such as those formed by the steel arch or the reinforcing steel in the walls and floors of earth-covered magazines (also referred to as bunkers, huts, or igloos) if the steel reinforcement is bonded together and it meets the bonding resistance of 8.10.7.1.
Statement (technical reason for FR)	This revision highlights the LEMP characteristics of Faraday LPS systems’.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
8.10.7	6	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	8.10.7 The lightning protection system shall be tested electrically on explosives facilities shall have bond resistance and earth to grounding electrode resistance tests performed at least every 14 months.		
First Revision Text (FR)	8.10.7		

	The lightning protection system shall be tested electrically on explosives facilities shall have bond resistance and earth to grounding electrode resistance tests performed at least every 14 months.
Statement (technical reason for FR)	
Response (technical reason for not making some changes or for resolving)	The proposed substantive changes to 8.10.7 are already included in the daughter clauses of 8.10.7.

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
8.10.7.6	8	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	8.10.7.6 The three-point fall-of-potential test method shall be used when measuring the resistance to earth of grounding systems for explosives facilities. <u>When space or other issues prevent ability to drive test stakes/rods to properly perform the three-point fall-of potential test, it is permissible to use a clamp on ground resistance meter to perform the test.</u>		
First Revision Text (FR)	8.10.7.6 8.10.7.6.1 The three-point fall-of-potential test method shall be used when measuring the resistance to earth of grounding systems for explosives facilities. 8.10.7.6.2 <u>When space or geophysical issues prevent the ability to drive test stakes or rods to properly perform the three-point fall-of potential test, the AHJ may permit the use of a clamp on ground resistance meter {rated for the purpose} to perform the test.</u> <u>If approved and where space or geophysical issues prevent the ability to drive test stakes or rods to properly perform the three-point fall-of potential test, a clamp on ground resistance meter rated for the purpose shall be used.</u>		
Statement (technical reason for FR)	The implementation of the clamp on style meter will require AHJ to ensure the proper use for this application.		
Response (technical reason for not making some			

changes or for resolving)	
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Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New 8.10.7.7	7	None	☐ Create First Revision ☒ Resolve
Proposed Text (PI)	8.10.7.7 Testing on Other than Single Ground Rod Electrode Systems Performing the three-point fall of potential test on other than single ground rod electrodes is permissible.		
First Revision Text (FR)			
Statement (technical reason for FR)			
Response (technical reason for not making some changes or for resolving)	The current wording of 8.10.7.6 requires the three-point-fall test method to be conducted for grounding systems, this is inclusive of “other than single ground rods”.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New 4.15.5	TG 8 CMT Proposal 1		☐ Create First Revision ☐ Resolve
Proposed Text (PI)			
First Revision Text (FR)	See below for revised text.		
Statement (technical reason for FR)	The requirements and criteria for fences and gates are based in providing mitigation for personnel protection not ordnance or ordnance facilities. The requirements are moved to Chapter 4.		
Response (technical reason for not making some changes or for resolving)			

[A.4.15.5](#) The bonding for metallic fences is to protect personnel who could come in contact with two parts of a metallic fence system that might become, including unintentionally, at different potentials through faults or charge build-up through inductance or direct/indirect strikes, and who might complete the path for the charge to go to ground. The grounding for any part of a metallic fence and objects within either side flash distance (including worst case: a person with outstretched arms with or without objects he might be holding/using to close the gate – such as a tool) of a person who could possibly touch two parts of a metallic fence/gate at the same time, is to prevent the person from becoming the path to ground (close an open circuit) for any charge buildup before or during a direct lightning strike. It is always best practice to not transit through gates when atmospheric conditions are conducive for a lightning event to occur.

If any part of a metallic fence and gatepost is within six feet of any part of a lightning protection (whether explosives or ordinary facilities), (examples: down conductor, ground rod of an LPS), 2 points of bonding to the LPS are necessary.

- a. Auxiliary equipment mounted on a fence (e.g. cameras, IDS, access control, mounting poles) needs to be considered for sideflash grounding and bonding control.
- b. Create a figure like 4.15.4.1 and develop a sideflash/touch potential analysis process/equations.

If the gateposts are spaced such that a person can walk through and touch both gate posts (including worst case: a person with outstretched arms, typically 6-8 feet), bonding (no mechanical connections) is necessary at the base, underground, able to be visually inspected or tested at the bond to the gate posts, deeply enough that the bonding conductor will not be broken or disturbed by movement of the vehicle as it passes through.

If a gate is wide enough for a person to walk through and touch both gate posts with any kind of attachment or equipment they may be holding, bonding (no mechanical connections) is necessary at the base, underground, able to be visually inspected or tested at the bond to the gate posts, deeply enough that the bonding conductor will not be broken or disturbed by movement of the vehicle as it passes through.

If a gate is wide enough that it allows a vehicle to be driven through it, grounding and bonding are necessary. Sideflash calculations may be used to evaluate for need to bond and ground.

If a gate is to be opened electronically – with codes or switches attached to an electrical source and the control interface is within sideflash hazard– the gate post must be bonded to the electrical feeder to the electronics and the ground rod at the pedestal feeder must be bonded to the gate post. If the electronic switch pedestal is within sideflash distance of the gate post and any other part of the metallic fence (another post), it must be bonded to both the gate post and the next fence post (that it is between) or to the two fence posts it might be between. Remotely controlled gates where personnel are expected to remain within the vehicle, and the gate operator is not adjacent to the gate area (outside sideflash or touch potential hazard), may be exempted from sideflash or touch potential consideration.

Areas where fences and gates provide for areas where personnel can gather and dwell for a given time. These fences and gates should be considered as the source for step potential threat.

[8.8.14.15.5.1](#)-Grounding.

[8.8.14.15.5.1.1](#) Fences shall be grounded where located within 6 ft (1.8 m) of a structure housing explosives by interconnection with the grounding system of the structure.

[8.8.14.15.5.1.2](#). Fences meeting the criteria of [8.8.14.15.5.1.1](#) shall also be grounded within 100 ft (30 m) on both sides of where overhead power lines cross the fence.

[8.8.14.15.5.1.3](#) Gate posts through which explosives material or personnel will pass shall be grounded in accordance with [8.8.14.15.5.3](#).

~~8-8.1.44.15.5.1.4~~ Metal single-strand fences with nonconductive posts requiring grounding in accordance with ~~8-8.14.15.5.1~~ shall use a main-size conductor extending the full height of the post.

~~8-8.1.54.15.5.1.5~~ The main-size conductor discussed in ~~8-8.1.44.15.5.1.4~~ shall be bonded to each single strand to form a continuous path to ground.

~~8-8.24.15.5.2~~ Bonding.

~~8-8.2.14.15.5.2.1~~ Fences shall be bonded across gates and other discontinuities in accordance with the requirements of ~~8-8.34.15.5.3~~.

~~8-8.2.24.15.5.2.2~~ Fencing mesh covered with nonconductive material shall be bonded to posts requiring grounding by ~~8-8.14.15.5.1~~.

~~8-8.34.15.5.3~~ Gates and Gate Posts.

~~8-8.3.14.15.5.3.1~~ All gate posts through which explosives material or personnel will pass shall be provided with a grounding electrode meeting the requirements of Section 4.12 using a main-size conductor.

~~8-8.3.24.15.5.3.2~~ Class I main-size conductors buried not less than 18 in. (450 mm) in depth shall interconnect posts on opposite sides of a gate.

~~8-8.3.34.15.5.3.3~~ Gates shall be bonded to their grounded support posts using a flexible secondary-size jumper.

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
N.1	53	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	N.1 General. The protection of nonmetallic tanks that might contain flammable vapors, flammable gases, or liquids that can give off flammable vapors requires measures above and beyond protection of other structures discussed in this standard. It is recommended that nonmetallic tanks not be used in applications where flammable vapors might be present. The recommendations in this annex are provided to identify methods that can be used to mitigate, but not eliminate, lightning-related damage. It is critical that the lightning protection address the threat of coupling of lightning electromagnetic impulse (LEMP) onto conductors in or on the nonmetallic tank. When nonmetallic tanks are employed, the lightning protection system design must be studied to ensure that the installation does not create an unintentional hazard. Given the complexity and varied geometries of the systems involved, an in-depth study should be completed to account for all ignition sources that can arise from the installation of the lightning protection system and the interaction with other associated systems. These include direct strikes, LEMP, internal arcing based on the induced voltages, and the associated thermal energies. It must be ensured that these threats are reduced to a level that does not exceed the autoignition properties of the fuel-air mixture that accumulates in the Among the benefits associated with non-metallic tanks are cost, resistance to corrosion and ease of transportation and installation. Among the problems associated with non-metallic tanks are electrical insulation properties, the accumulation and retention of static charge, thermal energy transmission, and transparency to LEMP. Therefore, it is critical that the lightning protection address the thermal and physical effects of direct lightning attachment, and the threat of arcing caused by induced voltages and differences in electrical potential caused by direct attachment, secondary effect and coupling of lightning electromagnetic impulse (LEMP) onto electrical masses and conductors in or on the nonmetallic tank. The owner/operator should determine the use of nonmetallic tanks based on the risks identified in the study.		
First Revision Text (FR)	N.1 General. The protection of nonmetallic tanks that might contain flammable vapors, flammable gases, or liquids that can give off flammable vapors requires measures above and beyond protection of other structures discussed in this standard. It is recommended that nonmetallic tanks not be used in applications where flammable vapors might be present. The recommendations in this annex are provided to identify methods that can be used to mitigate, but not eliminate, lightning-related damage. <u>Among the problems associated with non-metallic tanks are electrical insulation properties, the accumulation and retention of static charge, thermal energy transmission, and transparency to inducing potentials. Therefore, it is critical that the lightning protection address the thermal and physical effects of direct lightning attachment. This should include the thermal effects associated with the successful interception of a direct strike by the lightning protection system. It is critical that the lightning protection address the threat of coupling of lightning electromagnetic impulse (LEMP) onto conductors in or on the nonmetallic tank.</u> <u>Despite the fact that a lightning protection system as per chapter 4 of NFPA 780 can safely conduct the lightning current to ground, applied potentials of hundreds of kV or more will be impressed directly onto the tank's metallic components</u>		

	<u>which should be bonded to the lightning protection system. Any metallic components that are not bonded to the lightning protection system could create side-flash hazards.</u> It is critical that the lightning protection address the threat of coupling of lightning electromagnetic impulse (LEMP) onto conductors in or on the nonmetallic tank. When nonmetallic tanks are employed, the lightning protection system design must be studied to ensure that the installation does not create an unintentional hazard. Given the complexity and varied geometries of the systems involved, an in-depth study should be completed to account for all ignition sources that can arise from the installation of the lightning protection system and the interaction with other associated systems. These include direct strikes, LEMP, internal arcing based on the induced voltages, and the associated thermal energies. It must be ensured that these threats are reduced to a level that does not exceed the autoignition properties of the fuel-air mixture that accumulates in the tank. The owner/operator should determine the use of nonmetallic tanks based on the risks identified in the study.
Statement (technical reason for FR)	This revision clarifies the pros and cons of non-conductive tanks and clarifies ignition causes.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
N.2	103	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	N.2 Zone of Protection. To protect against direct strikes to nonmetallic tanks containing flammable vapors, flammable gases, or liquids that can give off flammable vapors, the radius of the rolling sphere should be 100 ft (30 m) or less.		
First Revision Text (FR)	N.2 Zone of Protection. <u>When the rolling sphere method is used</u> To protect against direct strikes to nonmetallic tanks containing flammable vapors, flammable gases, or liquids that can give off flammable vapors, the radius of the rolling sphere should be 100 ft (30 m) or less.		

Statement (technical reason for FR)	This clarifies that the zone of protection is not the only approach to be considered or a required method per N.1.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
N.4	104	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	N.4 Charge Neutralization. Reduction of differences in potential between the bound charge on the contained product and metallic components internal to the tank should be considered in parallel with and complementary to lightning protection. Accelerating the relaxation of differences in potential can reduce the likelihood of arcing. One technique is to install an inductive neutralizer as described in NFPA 77. This type of device could serve to increase the availability of ions to equalize charge between areas of different charge within the contained product and between charges on the contained product and tank metallic appurtenances. This appliance could take the form of a low impedance, conductive appliance suspended from and electrically bonded to the thief hatch or other grounded tank appurtenance and extending to the bottom of the tank so it penetrates the surface of the fluid at all fill levels. This appliance will not equalize the potential in all areas of the tank but can serve to equalize potential local to the appliance.		
First Revision Text (FR)	<u>N.4 Charge Neutralization.</u> <u>When oil and gas are extracted, they are accompanied by large volumes of produced water. When the fluid enters a tank, the pressure is reduced so entrapped gas effervesces out, producing a flammable mixture above the already flammable product. The process of the fluid entering the tank can create charge pockets within the tank. NFPA 77, <i>Recommended Practice on Static Electricity</i>, and API documents, such as those referenced in Annex O.1.2.1, provide recommendations on methods for charge neutralization.</u> N.4 Charge Neutralization. Reduction of differences in potential between the bound charge on the contained product and metallic components internal to the tank should be considered in parallel with and complementary to lightning protection. Accelerating the relaxation of differences in potential can reduce the likelihood of arcing.		

	One technique is to install an inductive neutralizer as described in NFPA 77. This type of device could serve to increase the availability of ions to equalize charge between areas of different charge within the contained product and between charges on the contained product and tank metallic appurtenances. This appliance could take the form of a low-impedance, conductive appliance suspended from and electrically bonded to the thief hatch or other grounded tank appurtenance and extending to the bottom of the tank so it penetrates the surface of the fluid at all fill levels. This appliance will not equalize the potential in all areas of the tank but can serve to equalize potential local to the appliance.
Statement (technical reason for FR)	The material provided in N.4 regarding charge neutralization is revised to directly point the reader to the applicable documents that discuss charge neutralization.
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New N.6	54	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	N.6. LEMP mitigation. To mitigate coupling of EMP onto conductive masses and conductors on and in a tank, it may be advantageous to coat the exterior of a non-metallic tank with a conductive paint. This paint should cover the entire tank, electrically bonding all tank appurtenances. Alternatively, such LEMP protection could take the form of conductive panels attached to the exterior of the tank and electrically bonded together, to tank appurtenances, and to ground.		
First Revision Text (FR)	<u>N.6. LEMP mitigation.</u> <u>To mitigate coupling of LEMP onto conductive masses and conductors on and in a tank, it may be advantageous to employ a faraday-like approach to mitigate electrical field effects.</u>		
Statement (technical reason for FR)	This new section addresses the problems of LEMP and suggests a potential approach to addressing them.		

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
10.3.3	None	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	10.3.3 NonconductingNonmetallic Masts. A nonmetallic-nonconducting mast not within the zone of protection of a strike termination device shall be provided with at least one air terminal that meets the requirements of a strike termination device. 10.3.3.1 An air terminal shall extend a minimum of 10 in. (254 mm) above <u>any conductive fittings on</u> the mast. 10.3.3.2 The top of an air terminal shall be sufficiently high that all masthead fittings are below the surface of a 90-degree inverted cone with its apex at the top of the air terminal. 10.3.3.3 Multiple air terminals shall be permitted to give the required zone of protection comprising overlapping zones of protection as described in 10.3.3.2. 10.3.3.4 An air terminal shall be securely fastened to the mast and connected to a main conductor as described in 10.4.1 <u>10.3.3.5</u> <u>The main conductor shall be permitted to be internal to the mast walls and any nonconducting fixture.</u>		
First Revision Text (FR)			
Statement (technical reason for FR)	The term “nonmetallic” can apply to fiberglass, wood, or carbon fiber. These materials have very different responses to electric fields associated with lightning streamers and return strokes. The new language addresses the concepts of “conducting” and “nonconducting” and creates new requirements for both insulating (that is, fiberglass) and anisotropic materials that may contain a mixture of conducting and nonconducting elements, in particular CFC and also wood.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New definitions			☒ Create First Revision ☐ Resolve
Proposed Text (PI)			
First Revision Text (FR)	3.x Nonconducting Any material that has an electrical relaxation time constant greater than 100 ms. 3.x Conducting Any material that has an electrical relaxation time constant less than 100 ns.		
Statement (technical reason for FR)	Newly revised Section 10.3.3 addresses the concepts of “conducting” and “nonconducting” and creates new requirements for both insulating (that is, fiberglass) and anisotropic materials that may contain a mixture of conducting and nonconducting elements, in particular CFC and also wood. This revision adds definitions of those terms.		
Response (technical reason for not making some changes or for resolving)			

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
New 10.3.4	None	None	☒ Create First Revision ☐ Resolve
Proposed Text (PI)	10.3.4 Carbon Fiber Composite Masts and Structures A10.3.4 Carbon fiber composites comprise a mixture of electrically conducting carbon fiber embedded in a nonconducting matrix. Since the relaxation time of the carbon is less than a picosecond, which is much shorter than the time scales of the lightning processes involved in attachment and return stroke processes, electrostatic conditions apply to physical processes such as surface charge buildup and electric field formation. 10.3.4.1 This section shall apply to any mast or structure constructed either of carbon fiber composite or constructed of materials that contain a mixture of conducting and nonconducting materials. A.10.3.4.1		

Whether or not a material is considered to be a conductor or not depends on the electrical recovery time (or electrical relaxation time) of the material. For an isotropic material the recovery time constant τ is:

$$\tau = \epsilon / \sigma$$

where

τ = time constant, s

ϵ = permittivity, F/m

σ = conductivity, S/m

If the recovery time is much shorter than the time scale of the current, then electrical fields, and internal currents, dissipate rapidly in the material and currents become concentrated near the outer surface of the conductor, penetrating to about the skin depth, and electric fields outside the material terminate on surface charge at its surface rather than penetrating inside the material. Hence the likelihood of electrical breakdown to the surface is enhanced. In this context, materials such as carbon fiber composite and wood can be considered to contain conductors.

10.3.4.12

An air terminal shall extend a minimum of 10 in. (254 mm) above the mast and any conducting fittings on the mast.

10.3.4.23

The top of an air terminal shall be of a height such that the top of the mast and all masthead fittings are below the surface of a 90-degree inverted cone with its apex at the top of the air terminal.

10.3.4.34

Multiple air terminals shall be permitted to give the required zone of protection comprising overlapping zones of protection as described in 10.3.3.2.

10.3.4.45

An air terminal shall be securely fastened to the mast and connected to a main conductor as described in 10.4.1.

10.3.4.56

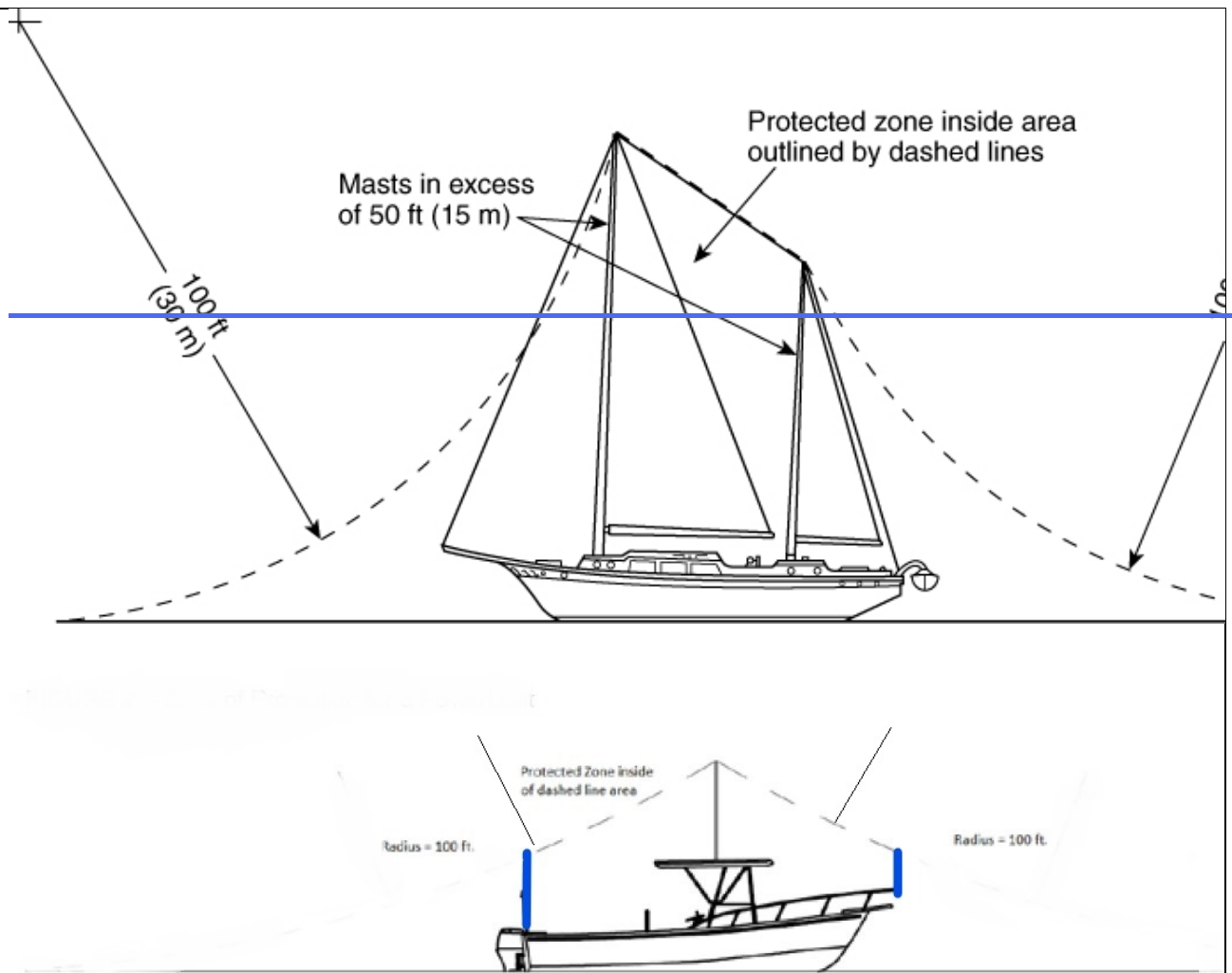
Strike termination devices, down conductors and connections to a carbon fiber mast shall be external to the mast.

10.3.4.67

	<u>No penetration of the mast wall by a metallic or other conducting fastener shall be permitted to fasten any component of the lightning protection system to the mast.</u> <u>10.3.4.89</u> <u>It shall be permitted to replace the main conductor in 10.3.4.4 with a conductor that satisfies the specifications for a down conductor appropriate for either a carbon fiber composite aircraft or carbon fiber composite wind turbine if all of the following conditions are met:</u> <u>1. The carbon fiber composite (CFC) mast is external to the watercraft.</u> <u>2. No part of the CFC mast is within 6 ft (2 m) of any person or vulnerable object.</u> <u>3. The alternative down conductor is connected to a main conductor at or above the location where the mast is secured to the watercraft.</u> <u>A.10.3.4.89</u> <u>Techniques for mitigating lightning effects in carbon fiber composites (CFC) using surface conductors have been used extensively in the aeronautics industry. These techniques are described in the AGATE “Lightning Direct Effects Handbook” Report Reference Number: AGATE-WP3.1-031027-043-Design Guideline Work Package Title: WBS3.0 Integrated Design and Manufacturing Date of General Release: March 1, 2002. Since there are common design considerations in the aircraft and marine industries, such as light-weight construction combined with high tensile strength, application of similar techniques to those used in aeronautics is desirable for specific marine applications. Since some of these techniques may result in potential gradients and surface breakdown that could cause injuries, application in watercraft should be limited to those structures, or parts of structures, where the risk of such an injury is unlikely.</u>
First Revision Text (FR)	See below for revised text.
Statement (technical reason for FR)	The consequences of routing a down conductor inside a CFC mast are that sparks form between the down conductor and the mast, current is injected into the composite, and the tensile strength of the mast is compromised as a result of individual fibers overheating. Reference: “Carbon and Lightning”, Roby Scalvini, Professional Boatbuilder, Number 128, Dec/Jan 2011, pp. 41-61, http://backissues.proboat.com/?m=69942&i=788842&p=52&search=carbon%20and%20lightning&ver=html5 Alternative specifications for lightning conductors are well documented. The following report gives a comprehensive discussion of then pertinent concepts. https://agate.niar.wichita.edu/Lightning/WP3.1-031027-043.pdf Reference: AGATE “Lightning Direct Effects Handbook” Report Reference Number: AGATE-WP3.1-031027-043-Design Guideline Work Package Title: WBS3.0 Integrated Design and

	Manufacturing Date of General Release: March 1, 2002. The AGATE report cites the following FAA regulations: Ch. 4 Pg 1 FAR's and AC's: Lightning protection requirements have therefore been included in the collection of Federal Aviation Regulations (FAR's) and Advisory Circulars (AC's) aimed at ensuring that the above goal is met for all except experimental and certain acrobatic aircraft. These regulations deal with the aircraft as a whole, and more specifically with the fuel system and other systems performing flight critical and essential functions. Specific regulations for each category of aircraft are reproduced in the following pages. As with most FAR's, they state a performance requirement, but do not include guidelines for compliance or specific technical design requirements. In this manner the FAR's allow the designer a maximum amount of flexibility. Emphasis is placed by the FAA on verification and compliance with the FAR's, in this case by demonstrating, often by test, that the designs do in fact provide the necessary protection. Lightning protection requirements are included in the FAR's for Transport Category Aircraft (Part 25), Normal, Utility and Acrobatic Aircraft (Part 23), which are hereinafter referred to as "General Aviation" aircraft, and for both categories of rotorcraft (Parts 27 and 29), though some differences in applicable paragraph numbering and wording exist. It will be noted that the lightning protection regulations are functional requirements which are comparatively brief. The intensity of the lightning environment, the frequency of lightning strike occurrences and locations where strikes enter or exit the aircraft are not provided in the protection regulations. The lightning environment for design and certification purposes is presented in FAA Advisory Circulars [4.1, 4.2], along with definitions of lightning strike zones and guidance for locating them on specific aircraft. 4.2.1 US Federal Aviation Regulations The basic lightning protection regulation for airframes is the same for all vehicle categories, and appears in the FAR's for general aviation aircraft as FAR 23.867. Identical regulations are applicable to the other categories for aircraft: Part 23.867 - Lightning Protection of Structure, This is the basic airframe lightning protection regulation, which requires that the aircraft be able to sustain a lightning strike without experiencing catastrophic damage. It reads: 23.867 Lightning protection of structure. (a) the airplane must be protected against catastrophic effects from lightning. (b) For Metallic components, compliance with paragraph (a) of this section may be shown by - (1) Bonding the components properly to the airframe; or (2) Designing the components so that a strike will not endanger the airplane (c) For nonmetallic components, compliance with paragraph (a) of this section may be shown by - (1) Designing the components to minimize the effect of a strike; or (2) Incorporating acceptable means of diverting the resulting electrical current so as not to endanger the airplane. [Amdt. 23 -7, 34 FR 13092, Aug. 13, 1969]
Response (technical reason for not making some changes or for resolving)	

Section	All PIs used for FR or Resolve	Other PIs that propose revisions for this section	MOTION
10.3.1	105	None	☒ ☐ Create First Revision ☐ Resolve
Proposed Text (PI)	10.3 Strike Termination. 10.3.1* Zone of Protection. A10.3.1 The bow and stern of a watercraft are locations where there is an enhanced risk of an upward streamer or direct strike. Since personnel may be at these locations, enhanced protective measures are needed, such as air terminals placed outside decks and working areas. Down conductors from these air terminals should be as vertical as possible, connected to the loop conductor, and terminate at a grounding electrode near the waterline. 10.3.1.1 The zone of protection for watercraft shall be based on a striking distance of 100 ft (30 m). 10.3.1.2 The zone of protection afforded by any configuration of masts or other elevated conductive objects shall be determined graphically or mathematically, as shown in Figure 10.3.1.2. The distance can be determined analytically for a 100 ft (30 m) striking distance with the following equation (units shall be consistent, ft or m): [10.3.1.2] $d = \sqrt{h_1(2R - h_1)} - \sqrt{h_2(2R - h_2)}$ d- horizontal protected distance h₁- height of strike termination device R- rolling sphere radius [100 ft (30 m)] h₂- height of object to be protected Figure 10.3.1.2 Diagram defining the zone of protection in of a Boat with Masts in Excess of 50 ft (15 m) Above the Water. [Protection based on lightning strike distance of 100 ft (30 m).]		



[10.3.1.3](#)

[The zone of protection shall extend at least 7 ft \(2.1 m\) above the deck for all regions of the boat that are occupied.](#)

[10.3.3.3-10.3.1.4](#)

Multiple air terminals shall be permitted to give the required zone of protection comprising overlapping zones of protection [as described in 10.3.3.2](#)

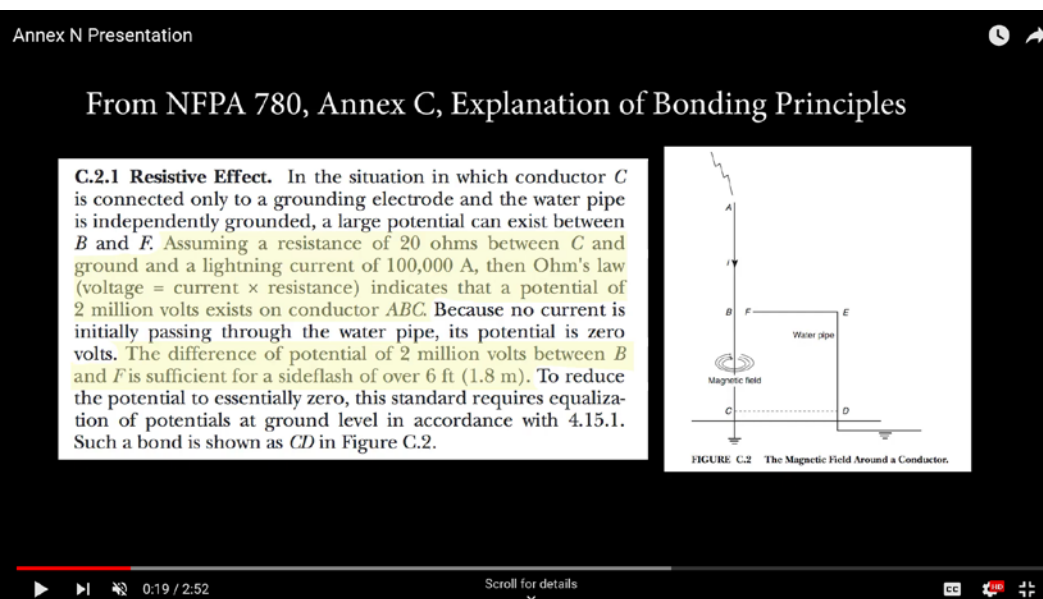
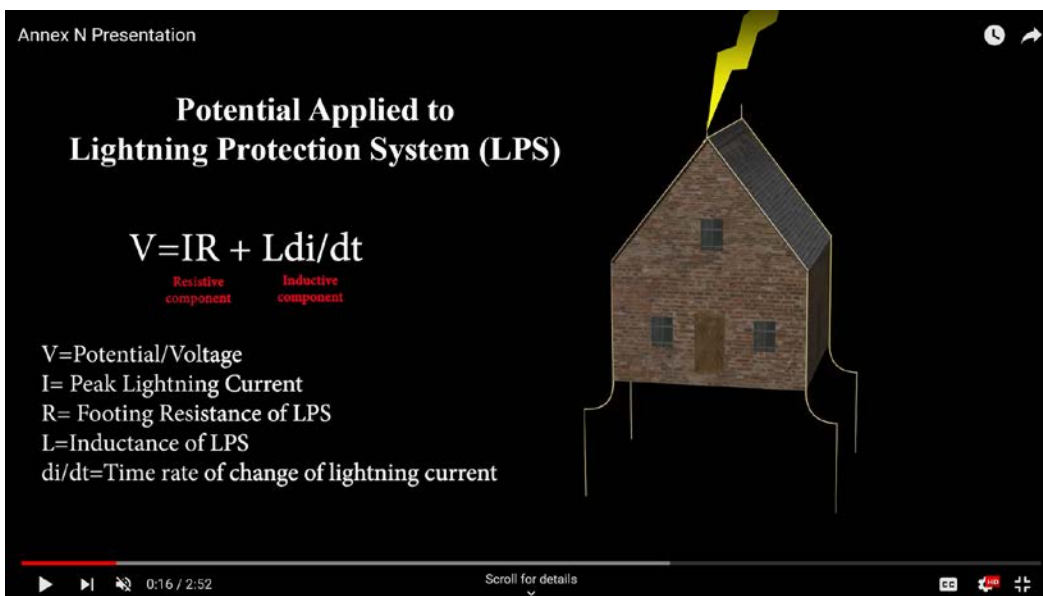
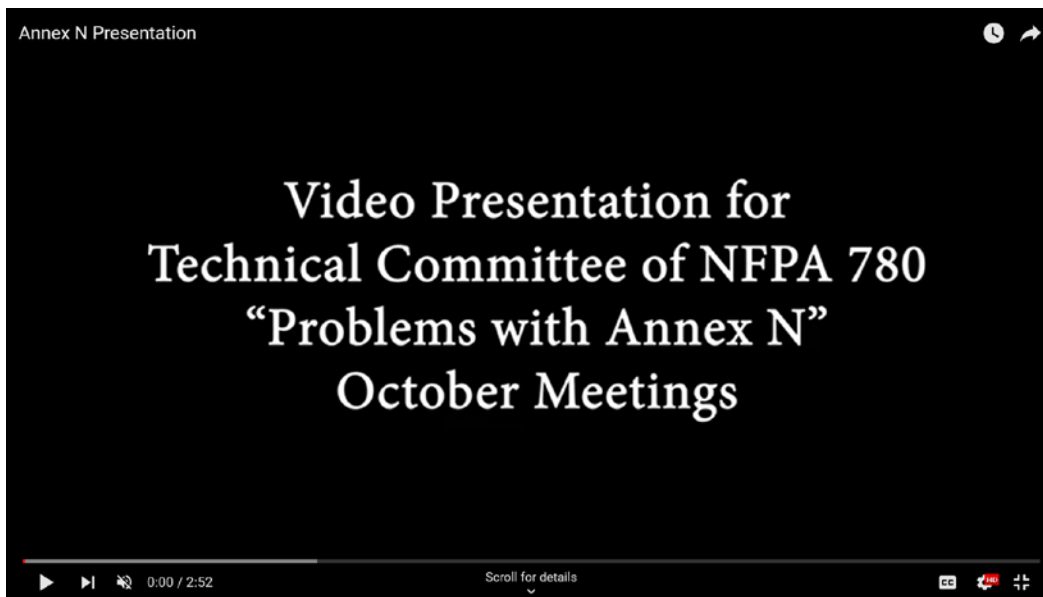
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Revisio
n Text
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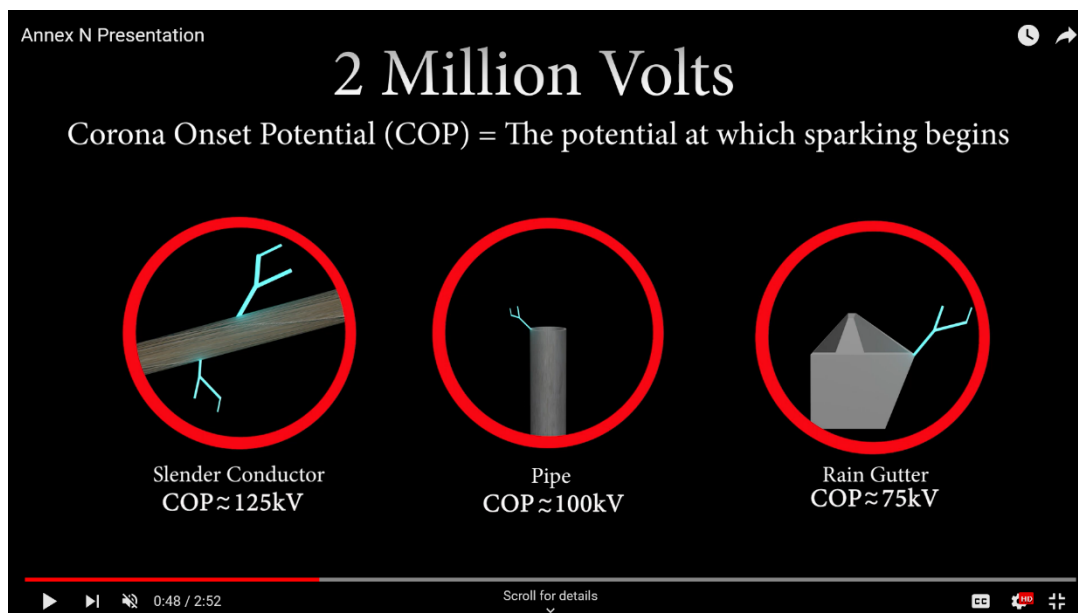
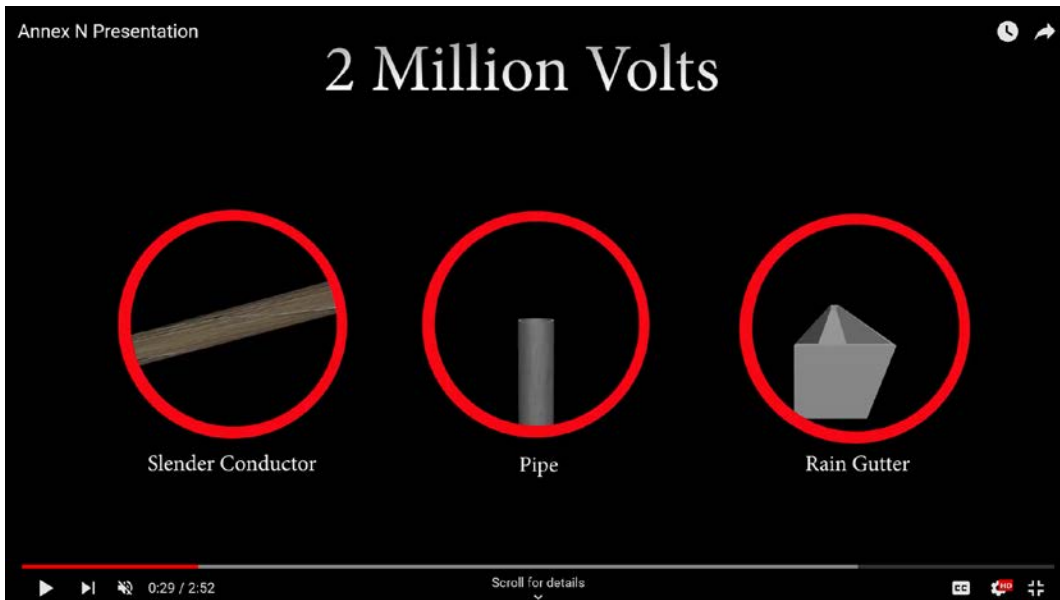
Stateme
nt
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reason
for FR)

Since the electric field enhancement factor of a person standing in the “protected zone” is much larger than that of the flat surface where the ball touches the horizontal ground, the likelihood of streamer initiation may be larger for the person. For a mast that is lower than the sphere radius, this predicted zone of protection extends outside that of the cone of protection with 90 degree apex angle.

	Section 10.3 is modified to give a higher level of protection for personnel and sensitive structures on a watercraft since any lightning damage is inherently more life threatening. 10.3.1.4 allows the zone of protection to include any person standing upright on a deck. Recent research concerning lightning attachment processes has revealed fundamental aspects that weaken the basis of the rolling sphere model – that a structure is protected from initiating an upward streamer if it is within the striking distance of an air terminal, where a conservative value for the striking distance is 30m. The hypothesis for the rolling sphere model is that the upward streamer is initiated from the grounded object when it is the striking distance from the tip of the stepped leader. Hence any other objects nearby, if in the “zone of protection” are protected, that is, they do not initiate upward streamers. However, this research documents a lightning strike with a single ground-point attachment that initiated 31 upward streamers over a fairly large area, many beginning when the stepped leader was still far from ground. While this research refutes the fundamental assumption of the rolling sphere model that only one upward streamer is initiated, it does not necessarily invalidate the rolling sphere model as an empirical technique for determining air terminal placement on buildings. In fact, it tends to support it in that the upward-going streamers documented consistently emanate from exposed locations where the rolling sphere model would dictate that they be placed. The reference is Marcelo M. F. Saba, Diego Rhamon R. da Silva, John G. Pantuso, Caitano L. da Silva,, Close View of the Lightning Attachment Process Unveils the Streamer Zone Fine Structure, Geophysical Research Letters, Vol. 49, Issue 24, pp. The multiple upward streamers visible on this photo of close lightning striking the ocean illustrate the high risk of upward streamer formation close to a lightning attachment to water.
Response (technical reason for not making some changes or for resolving)	

The full video is available online at https://www.youtube.com/watch?v=60TSYQW4D_c





Annex N Presentation

Lightning Protection System as per Annex N of NFPA 780

UL 96 listed strike termination device (brush) installed as per requirements of 4.8.1 of NFPA 780. Section N.2 of Annex N.

Metallic appurtenances bonded together and electrically connected to ground/LPS. Section N.3. If you do not bond to LPS you create sideflash hazard

Bonding of metallic components is necessary to avoid sideflashes, but it creates a new hazard

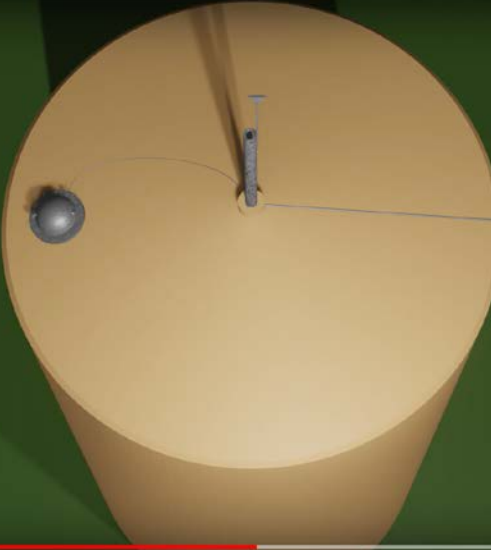


1:24 / 2:52

Scroll for details

Annex N Presentation

Bonding of metallic components is necessary to avoid sideflashes, but it creates a new hazard



1:25 / 2:52

Scroll for details

Annex N Presentation

Lightning Protection System as per Annex N of NFPA 780

UL 96 listed strike termination device (brush) installed as per requirements of 4.8.1 of NFPA 780. Section N.2 of Annex N.

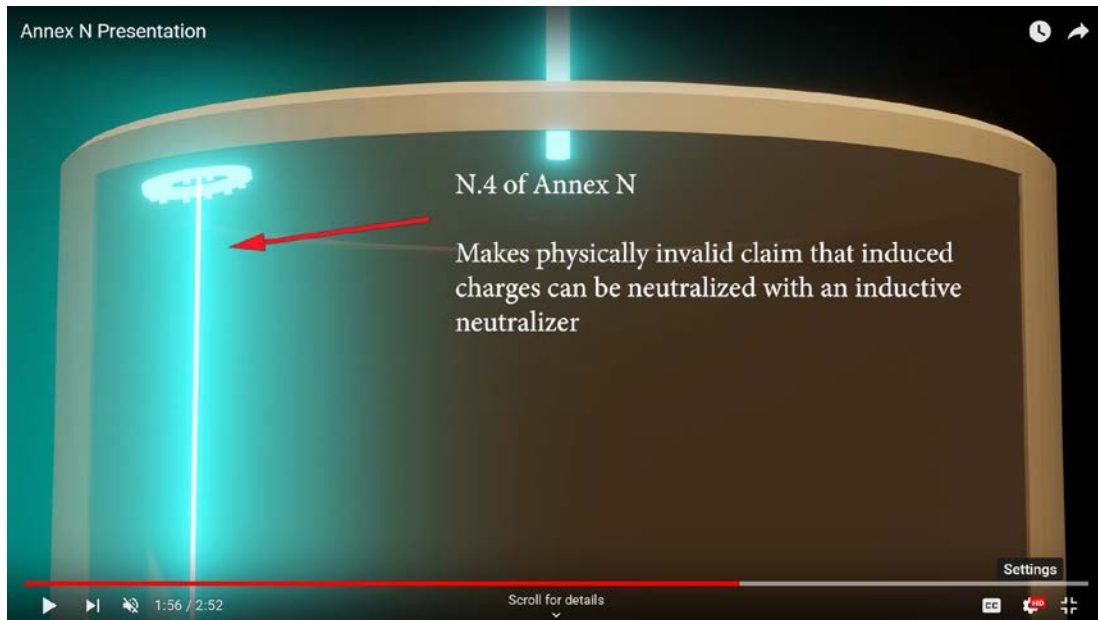
Metallic appurtenances bonded together and electrically connected to ground/LPS. Section N.3. If you do not bond to LPS you create sideflash hazard

Bonding of metallic components is necessary to avoid sideflashes, but it creates a new hazard



1:36 / 2:52

Scroll for details



Thanks for watching



Public Comment No. 33-NFPA 780-2024 [Section No. 1.1.1]

1.1.1

This document shall cover traditional lightning protection system installation requirements for the following:

- (1) Ordinary structures
- (2) Miscellaneous structures and special occupancies
- (3) Heavy-duty stacks and corrosive environments
- (4) Structures containing flammable vapors, flammable gases, or liquids that can give off flammable vapors
- (5) Structures housing explosive materials
- (6) Wind turbines
- (7) Watercraft
- (8) Airfield lighting circuits
- (9) Solar arrays

Statement of Problem and Substantiation for Public Comment

add corrosive environments

Related Item

- 4.1

Submitter Information Verification

Submitter Full Name: Bruce Kaiser

Organization: Lightning Master Corporation

Street Address:

City:

State:

Zip:

Submittal Date: Wed May 29 12:07:35 EDT 2024

Committee: LIG-AAA



Public Comment No. 28-NFPA 780-2024 [Section No. 1.6]

1.6* Maintenance of metal edge systems or gutters during installation of lightning protection systems .

Guidelines for the maintenance of the lightning protection system shall be provided to the owner at the completion of installation. Components of lightning protection systems attached to ANSI/SPRI/FM 4435/ES-1 or ANSI/SPRI GT-1 tested metal edge systems or gutters shall be installed with compatible brackets, fasteners or adhesives, in accordance with the metal edge systems or gutter manufacturer's installation instructions. Installation shall be as directed by a registered design professional when the metal edge system or gutter manufacturer is unknown.

Statement of Problem and Substantiation for Public Comment

This comment emphasizes the critical need for lightning protection systems (LPS) to be installed in accordance with the manufacturer's installation instructions for roof assemblies, coverings, metal edge systems, or gutters. The term "manufacturer" refers to the entity responsible for producing these roof components, which could be the roofing contractor, the roofing membrane manufacturer, or another manufacturing company. This ensures that the LPS does not compromise the integrity and performance of the roof components.

Key Points:

1. Adherence to Manufacturer Instructions:
 - o LPS attachments must follow the installation guidelines provided by the manufacturers of the roof assembly, covering, metal edge systems, or gutters.
2. Definition of Manufacturer:
 - o The manufacturer is defined as the entity that produced the roof components, which could be a roofing contractor, membrane manufacturer, or another responsible manufacturing company.
3. Proper Flashing:
 - o Where LPS components attach to or penetrate the roof, proper flashing is essential to prevent leaks and maintain the roof's integrity.
4. Role of Design Professionals:
 - o In cases where the manufacturer of the roof components is unknown or out of business, a registered design professional must provide guidance on attachment methods that preserve the roof's integrity while allowing for the LPS installation.
5. Documented Failures:
 - o There have been documented failures of roof assembly components during moderate wind events where LPS were attached. These failures highlight the importance of proper attachment methods to prevent wind load alterations and performance issues such as restricted thermal movement, galvanic reactions, and leak points.
6. Independence of LPS Attachments:
 - o The comment encourages the use of methods and details that allow LPS systems to be attached independently of coping, fascia, gutters, and roof assembly components. This approach helps maintain the integrity of these tested components and the building envelope.

Importance of the Comment:

- Safety and Performance: Ensuring that LPS installations do not compromise the structural integrity and performance of roof components is crucial for safety and building longevity.
- Compliance with Codes: By following the manufacturer's instructions and ensuring proper flashing, the installations remain compliant with building codes and standards.
- Adaptability: Providing guidance for situations where the original manufacturer is unavailable ensures that LPS installations can still proceed without compromising roof integrity.

Conclusion:

This comment aims to maintain the integrity and performance of roof assemblies when installing lightning protection systems by adhering to manufacturer instructions and ensuring proper flashing. It

also addresses scenarios where manufacturer instructions are unavailable by involving registered design professionals to determine suitable attachment methods.

A coordinating proposal has been submitted to NFPA 5000 for consideration.

Related Item

- FR-46

Submitter Information Verification

Submitter Full Name: Amanda Hickman
Organization: The Hickman Group
Affiliation: Single-Ply Roofing Industry (SPRI)
Street Address:
City:
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Submittal Date: Fri May 17 12:41:15 EDT 2024
Committee: LIG-AAA



Public Comment No. 1-NFPA 780-2024 [New Section after 3.3.9]

40% Copper-Clad Steel Wire (40% CCS)

40% Copper-Clad Steel Wire (40% CCS) Wire consisting of a core of homogeneous steel with a continuous outer cladding of copper metallurgically bonded to the core throughout to have minimum copper thickness of 9% of the wire diameter.

Statement of Problem and Substantiation for Public Comment

This adds a definition for 40% CCS as a permitted wiring method for use in this standard when the material is in compliance with ASTM B 910 and B 227. A minimum copper thickness of 9% of the wire diameter equates to 40% copper cladding. Copper-Clad Steel (CCS) has been widely used as a conductor material for lightning protection since the 1920s. It is referenced in NFPA 780 as an overhead ground wire to protect conductors and equipment positioned on distribution towers, providing evidence of its performance capability. 40% CCS is the commercially available grade of CCS with the highest copper content to ensure both maximum corrosion resistance and maximum conductivity. This PC defines 40% CCS in NFPA 780.

Related Item

- Public Input 10 NFPA 780-2023

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

Affiliation: American Bimetallic Association

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Submittal Date: Sun May 12 07:09:24 EDT 2024

Committee: LIG-AAA



Public Comment No. 34-NFPA 780-2024 [New Section after 3.3.32.2]

TITLE OF NEW CONTENT

Type your content here ...Class III materials shall meet the dimension, weight, and other requirements of Class II materials and shall be made of corrosion resistant materials.

Statement of Problem and Substantiation for Public Comment

create a materials class that allows for the use of corrosion resistant materials

Related Item

- PI 116, 4.1.1.1.2

Submitter Information Verification

Submitter Full Name: Bruce Kaiser

Organization: Lightning Master Corporation

Street Address:

City:

State:

Zip:

Submittal Date: Wed May 29 12:19:00 EDT 2024

Committee: LIG-AAA



Public Comment No. 2-NFPA 780-2024 [Section No. 4.1.1.1.1]

4.1.1.1.1

Structures not exceeding 75 ft (23 m) in height shall be protected with Class I materials as shown in Table 4.1.1.1.1.

Table 4.1.1.1.1 Minimum Class I Material Requirements

Type of Conductor	Parameter			<u>Copper</u>		<u>Copper/Copper-Clad Steel</u>		<u>Aluminum</u>
		<u>US</u>	<u>SI</u>		<u>US</u>	<u>SI</u>		
Air terminal, solid	Diameter	3/8 in.	9.5 mm	-	1/2 in.	12.7 mm		
Air terminal, tubular	Diameter	5/8 in.	15.9 mm	-	5/8 in.	15.9 mm		
	-	Wall thickness	0.033 in.	0.8 mm	-	0.064 in.	1.63 mm	
Main conductor, cable	Size each strand	17 AWG	1.04 mm ²	-	14 AWG	2.08 mm ²		
	-	Weight per length	187 lb/1000 ft	278 g/m				
	-		172 lb/1000 ft	-	95 lb/1000 ft	141 g/m		
	-		*	*				
	-	Cross-section area	57,400 cir. mils	29 mm ²	-	98,600 cir. mils	50 mm ²	
Bonding conductor, cable (solid or stranded)	Size each strand	17 AWG	1.04 mm ²	-	14 AWG	2.08 mm ²		
	Cross-section area	26,240 cir. mils	13.3 mm ²	-	41,100 cir. mils	20.8 mm ²		
Bonding conductor, solid strip	Thickness	0.051 in.	1.30 mm	-	0.064 in.	1.63 mm		
	-	Width	1/2 in.	12.7 mm	-	1/2 in.	12.7 mm	
Main conductor, solid strip	Thickness	0.051 in.	1.30 mm	-	0.064 in.	1.63 mm		
	-	Cross-section area	57,400 cir. mils	29 mm ²	-	98,600 cir. mils	50 mm ²	

* Relevant to Copper-Clad Steel

Statement of Problem and Substantiation for Public Comment

This adds 40% CCS to the table as an acceptable material type. History of usage as a conductor material employed in lightning protection applications, and the laboratory work of the CCS 780 Task

Group has provided sufficient evidence that 40% CCS meets the minimum requirements for performance.

Related Item

- Public Input NO. 11-NFPA 780-2023

Submitter Information Verification

Submitter Full Name: Peter Graser
Organization: Copperweld Bimetallics, LLC.
Affiliation: American Bimetallic Association
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City:
State:
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Submittal Date: Sun May 12 07:41:34 EDT 2024
Committee: LIG-AAA



Public Comment No. 3-NFPA 780-2024 [Section No. 4.1.1.1.2]

4.1.1.1.2

Structures exceeding 75 ft (23 m) in height shall be protected with Class II materials as shown in Table 4.1.1.1.2.

Table 4.1.1.1.2 Minimum Class II Material Requirements

Type of Conductor	Parameter			<u>Copper</u>		<u>Copper/Copper-Clad Steel</u>		<u>Aluminum</u>
		<u>US</u>	<u>SI</u>		<u>US</u>	<u>SI</u>		
Air terminal, solid	Diameter	½ in.	12.7 mm	-	⅝ in.	15.9 mm		
Main conductor, cable	Size each strand	15 AWG	1.65 mm ²	-	13 AWG	2.62 mm ²		
	Weight per length		375 lb/1000 ft	558 g/m				
	-		345 lb/1000 ft *	513 g/m*	190 lb/1000 ft	283 g/m		
	Cross-section area		115,000 cir. mils	58 mm ² -		192,000 cir. mils	97 mm ²	
Bonding conductor, cable (solid or stranded)	Size each strand	17 AWG	1.04 mm ²	-	14 AWG	2.08 mm ²		
	Cross-section area	26,240 cir. mils	13.2 mm ²	-	41,100 cir. mils	20.8 mm ²		
Bonding conductor, solid strip	Thickness	0.051 in.	1.30 mm	-	0.064 in.	1.63 mm		
	Width		½ in.	12.7 mm -		½ in.	12.7 mm	
Main conductor, solid strip	Thickness	0.064 in.	1.63 mm	-	0.1026 in.	2.61 mm		
	Cross-section area		115,000 cir. mils	58 mm ² -		192,000 cir. mils	97 mm ²	

* Relevant to CCS 40% Conductor Material

Statement of Problem and Substantiation for Public Comment

This adds 40% CCS to the table along with copper (CU) as an acceptable alternative material type. History of usage as a conductor material employed in lightning protection applications, and the laboratory work of the CCS 780 Task Group has provided sufficient evidence that 40% CCS meets the minimum requirements for performance.

Related Item

- Public Input 12

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

Affiliation: American Bimetallic Association

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City:

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Submittal Date: Sun May 12 08:14:58 EDT 2024

Committee: LIG-AAA



Public Comment No. 5-NFPA 780-2024 [Section No. 4.2.3]

4.2.3

Copper and 40% CCS lightning protection materials shall not be installed on or in contact with aluminum roofing, aluminum siding, or other aluminum surfaces.

Statement of Problem and Substantiation for Public Comment

This adds 40% CCS to the table along with copper (CU) as an acceptable alternative material type. History of usage as a conductor material employed in lightning protection applications, and the laboratory work of the CCS 780 Task Group has provided sufficient evidence that 40% CCS meets the minimum requirements for performance.

Related Item

- Public Input 13 NFPA 780

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

Affiliation: American Bimetallic Association

Street Address:

City:

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Zip:

Submittal Date: Sun May 12 08:36:45 EDT 2024

Committee: LIG-AAA



Public Comment No. 6-NFPA 780-2024 [Section No. 4.2.5]

4.2.5*

Lightning protection systems shall be designed to minimize the effects caused by runoff ~~from both copper and copper~~ from copper, 40% CCS, and aluminum lightning protection materials to prevent the deterioration of incompatible materials and minimize the degradation of building aesthetics caused by staining.

Statement of Problem and Substantiation for Public Comment

This adds 40% CCS to the table along with copper (CU) as an acceptable alternative material type. History of usage as a conductor material employed in lightning protection applications, and the laboratory work of the CCS 780 Task Group has provided sufficient evidence that 40% CCS meets the minimum requirements for performance.

Related Item

- Public Input 14 2023 NFPA 780

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

Affiliation: American Bimetallic Association

Street Address:

City:

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Submittal Date: Sun May 12 08:38:45 EDT 2024

Committee: LIG-AAA



Public Comment No. 8-NFPA 780-2024 [Section No. 4.3.2]

4.3.2

Copper or 40% CCS components installed within 24 in. (600 mm) of the top of a chimney or vent emitting corrosive gases shall be protected by a hot-dipped lead or tin coating.

Statement of Problem and Substantiation for Public Comment

This ensures both CU and 40% CCS are properly protected from chimney or vent emitting corrosive gases.

Related Item

- Public Input No. 15-NFPA 780-2023

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

Affiliation: American Bimetallic Association

Street Address:

City:

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Submittal Date: Sun May 12 08:44:04 EDT 2024

Committee: LIG-AAA



Public Comment No. 9-NFPA 780-2024 [Section No. 4.3.4.2]

4.3.4.2

Bimetallic connectors and fittings shall be used for splicing or bonding dissimilar metals.

Informational Note: Copper-clad steel is dissimilar to aluminum, and not dissimilar to copper

Statement of Problem and Substantiation for Public Comment

Information guidance offered to users regarding the galvanic corrosion properties of CCS.

Related Item

- Public Input No. 16-NFPA 780-2023

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

Affiliation: American Bimetallic Association

Street Address:

City:

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Submittal Date: Sun May 12 08:48:42 EDT 2024

Committee: LIG-AAA



Public Comment No. 10-NFPA 780-2024 [Section No. 4.5.4.6]

4.5.4.6

Connections between galvanized steel overhead ground wires and copper or 40% CCS conductors shall be made through a suitable component that does not permit direct contact between the two materials.

Statement of Problem and Substantiation for Public Comment

The use of 40% CCS would have the same corrosive concerns as copper conductors have so needs to be added to this rule

Related Item

- Public Input No. 17-NFPA 780-2023

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

Affiliation: American Bimetallic Association

Street Address:

City:

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Submittal Date: Sun May 12 08:52:33 EDT 2024

Committee: LIG-AAA



Public Comment No. 11-NFPA 780-2024 [Section No. 4.12.3.2]

4.12.3.2*

The concrete-encased electrode shall consist of one of the following:

- (1) Not less than 20 ft (6 m) of bare copper or 40% CCS main-size conductor
- (2) At least 20 ft (6 m) of one or more bare or electrically conductive coated steel reinforcing bars or rods not less than ½ in. (12.7 mm) in diameter that have been effectively bonded together by welding, structural mechanical coupling, or overlapping 20 diameters and wire tying

Statement of Problem and Substantiation for Public Comment

40% CCS is added to the section as the criteria for a copper concrete-encased electrode is the same for 40% CCS.

Related Item

- Public Input No. 18-NFPA 780-2023

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

Affiliation: American Bimetallic Association

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City:

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Submittal Date: Sun May 12 09:18:19 EDT 2024

Committee: LIG-AAA



Public Comment No. 30-NFPA 780-2024 [Section No. 4.19.3.7]

4.19.3.7

The conductor between the surge arrester and the line, and the surge arrester and the grounding connection shall either not be smaller than 6 AWG copper 4 AWG aluminum or use a conductive material that has a capacity and withstand rating equivalent to at least a 6 AWG copper conductor.

Statement of Problem and Substantiation for Public Comment

There should be a comma added after "line" to match the NEC language to match the NEC language, e.g. 242.52.

242.52 Surge-Arrester Conductors.

The conductor between the surge arrester and the line, and the surge arrester and the grounding connection, shall not be smaller than 6 AWG copper or aluminum.

Related Item

- FR 31

Submitter Information Verification

Submitter Full Name: David Gerstetter

Organization: UL Solutions

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 20 13:42:09 EDT 2024

Committee: LIG-AAA



Public Comment No. 39-NFPA 780-2024 [Section No. 6.2.1]

6.2.1 General.

Materials shall be Class II or Class III as shown in Table 4.1.1.1.2 and as described in this chapter.

Statement of Problem and Substantiation for Public Comment

allow the use of Class III material

Related Item

- PI 116, 4.1.1.1.2

Submitter Information Verification

Submitter Full Name: Bruce Kaiser

Organization: Lightning Master Corporation

Street Address:

City:

State:

Zip:

Submittal Date: Thu May 30 14:44:40 EDT 2024

Committee: LIG-AAA



Public Comment No. 13-NFPA 780-2024 [Section No. 6.2.2 [Excluding any Sub-Sections]]

Copper, 40% CCS, and bronze materials used on the upper 25 ft (7.6 m) of a stack shall have a continuous covering of lead having a minimum thickness of 0.064 in. (1.63 mm) to resist corrosion by flue gases.

Statement of Problem and Substantiation for Public Comment

40% CCS is added to the section to ensure the material is effectively protected the same as copper and bronze materials.

Related Item

- Public Input No. 20-NFPA 780-2023

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

Affiliation: American Bimetallic Association

Street Address:

City:

State:

Zip:

Submittal Date: Sun May 12 09:28:36 EDT 2024

Committee: LIG-AAA



Public Comment No. 40-NFPA 780-2024 [Section No. 6.3 [Excluding any Sub-Sections]]

Strike termination devices shall be made of solid copper, stainless steel, titanium, ~~or Monel[®]~~
metal Monel[®] or other suitable material of equivalent corrosion resistance .

Statement of Problem and Substantiation for Public Comment

allow additional suitable corrosion resistant materials

Related Item

- PI 116, 4.1.1.1.2

Submitter Information Verification

Submitter Full Name: Bruce Kaiser

Organization: Lightning Master Corporation

Street Address:

City:

State:

Zip:

Submittal Date: Thu May 30 14:46:57 EDT 2024

Committee: LIG-AAA



Public Comment No. 14-NFPA 780-2024 [Section No. 6.4.1.1]

6.4.1.1

Conductors shall be copper or 40% CCS , weighing not less than 375 lb per 1000 ft (558 g per m) without the lead coating, or approved corrosion-resistant material or coating.

Statement of Problem and Substantiation for Public Comment

This adds a requirement that 40% CCS conductors used for this application also meet the weight per 1,000 ft. criteria established for copper.

Related Item

- Public Input No. 21-NFPA 780-2023

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

Affiliation: American Bimetallic Association

Street Address:

City:

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Submittal Date: Sun May 12 11:32:44 EDT 2024

Committee: LIG-AAA



Public Comment No. 15-NFPA 780-2024 [Section No. 8.4.2.4]

8.4.2.4*

Ground ring electrodes shall be bare copper or 40% CCS conductors meeting or exceeding ~~405~~ 115,000 circular mils.

Statement of Problem and Substantiation for Public Comment

This adds 40% CCS to the rule and increases the circular mil to 115,000 to revert back to sizing of Class II materials as defined in 2020 edition.

Related Item

- Public Input No. 22-NFPA 780-2023

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

Affiliation: American Bimetallic Association

Street Address:

City:

State:

Zip:

Submittal Date: Sun May 12 11:35:14 EDT 2024

Committee: LIG-AAA



Public Comment No. 35-NFPA 780-2024 [Section No. 8.6.1]

8.6.1

Power and metallic communications lines (including intrusion detection lines) shall enter the facility ~~in shielded cables or metallic conduit run~~ underground for at least 50 ft (15 m) from the structure.

8.6.1.1

Metallic conduit shall be installed where power and communication lines are not provided with surge protection located immediately adjacent to entering the conduit run.

8.6.1.2

Non-metallic conduit shall be permitted when the power and communication lines are provided surge suppression located immediately adjacent to entering the conduit run and at the service panel after entering the building.

Statement of Problem and Substantiation for Public Comment

The use metallic conduit created an EES that includes multiple parallel paths (Ground Loops) which promote a situation where Objectionable Current that is specifically prohibited in the NEC (NFPA 70, Article 250.6) as it creates a personnel shock hazard. Historically, the implementation of metal conduit was to provide for reactance choking of the lightning energy transition into the facility through the electric service. Surge protection technological advancement and implementation requirements (cascaded protective devices) in modern electric service installations has resulted in minimized impact from the reactance choke effects of this requirement.

Related Item

- First Draft Report

Submitter Information Verification

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Submittal Date: Thu May 30 09:50:00 EDT 2024

Committee: LIG-AAA



Public Comment No. 31-NFPA 780-2024 [Section No. 8.9.7.6]

8.9.7.6 Three-Point Fall-of-Potential Test: Resistance to Earth Of Grounding Systems shall be measured in accordance with 8.9.7.6.1 or 8.9.7.6.2.

8.9.7.6.1

The three-point fall-of-potential test method shall be used when measuring the resistance to earth of grounding systems for explosives facilities.

8.9.7.6.2

Where space or geophysical issues prevent the ability to drive test stakes or rods to properly perform the three-point fall-of potential test, a clamp-on ground resistance meter shall be used in accordance with the manufacturer's instructions as permitted by the AHJ.

Statement of Problem and Substantiation for Public Comment

The original FR has has a requirement in 8.9.7.6.1 then a contradictory requirement in 8.9.7.6.2 The revised text more clearly indicates that both clauses are requirements and that the most applicable shall be used.

Related Item

- FR-44

Submitter Information Verification

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Submittal Date: Mon May 20 13:52:20 EDT 2024

Committee: LIG-AAA



Public Comment No. 16-NFPA 780-2024 [Section No. 10.2.2.1]

10.2.2.1

Copper and 40% CCS conductors shall be tinned.

Statement of Problem and Substantiation for Public Comment

This adds 40% CCS to the rule as an equivalency for the needed protection of copper conductors.

Related Item

- Public Input No. 23-NFPA 780-2023

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

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Submittal Date: Sun May 12 11:39:17 EDT 2024

Committee: LIG-AAA



Public Comment No. 17-NFPA 780-2024 [Section No. 10.2.2.3]

10.2.2.3

The use of conducting materials other than copper, such as 40% CCS, aluminum, stainless steel, and bronze, shall be permitted, provided they meet all requirements in this chapter.

Statement of Problem and Substantiation for Public Comment

The allowance of 40% CCS should also be required to comply with the provisions of this chapter along with the other listed material types.

Related Item

- Public Input No. 25-NFPA 780-2023

Submitter Information Verification

Submitter Full Name: Peter Graser

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Street Address:

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Submittal Date: Sun May 12 11:42:51 EDT 2024

Committee: LIG-AAA



Public Comment No. 18-NFPA 780-2024 [Section No. 10.4.1.1]

10.4.1.1*

A main conductor made of copper or 40% CCS shall have a cross-sectional area of at least 0.033 in.² (21 mm²).

Statement of Problem and Substantiation for Public Comment

40% CCS is added to this section to ensure it is sized equivalent to copper when used as a main conductor.

Related Item

- Public Input No. 26-NFPA 780-2023

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

Affiliation: American Bimetallic Association

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Submittal Date: Sun May 12 11:45:05 EDT 2024

Committee: LIG-AAA



Public Comment No. 19-NFPA 780-2024 [Section No. 10.4.2.1]

10.4.2.1

A bonding conductor made of copper or 40% CCS shall have a cross-sectional area of at least 0.013 in.² (8.3 mm²).

Statement of Problem and Substantiation for Public Comment

40% CCS is added to this section to ensure it is sized equivalent to copper when used as a bonding conductor.

Related Item

- Public Input No. 27-NFPA 780-2023

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

Affiliation: American Bimetallic Association

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Submittal Date: Sun May 12 11:47:02 EDT 2024

Committee: LIG-AAA



Public Comment No. 20-NFPA 780-2024 [Section No. 10.4.5.2.1]

10.4.5.2.1

The minimum contact area for a connection in a main conductor shall be given by 10.4.1.1 (for copper or 40% CCS), 10.4.1.2 (for aluminum), or 10.4.1.3 (for other metals).

Statement of Problem and Substantiation for Public Comment

This adds 40% CCS to align with similar action taken in 10.4.1.1.

Related Item

- Public Input No. 28-NFPA 780-2023

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

Affiliation: American Bimetallic Association

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Submittal Date: Sun May 12 11:49:04 EDT 2024

Committee: LIG-AAA



Public Comment No. 21-NFPA 780-2024 [Section No. 11.4.1.1]

11.4.1.1*

The counterpoise conductor shall be a bare, annealed, or soft drawn, solid copper or 40% CCS conductor not smaller than 6 AWG.

Statement of Problem and Substantiation for Public Comment

This adds 40% CCS as an alternative to copper for the counterpoise conductor.

Related Item

- Public Input No. 29-NFPA 780-2023

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

Affiliation: American Bimetallic Association

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Submittal Date: Sun May 12 11:51:33 EDT 2024

Committee: LIG-AAA



Public Comment No. 22-NFPA 780-2024 [Section No. 11.4.1.2]

11.4.1.2*

In locations where bare copper ~~counterpoise~~ or 40% CCS counterpoise conductors will be adversely affected by the environment, corrosion-resistant materials (e.g., tinned copper, stainless steel) as permitted by the AHJ shall be utilized.

Statement of Problem and Substantiation for Public Comment

This adds 40% CCS to the section and annex materials to ensure equivalent corrosion protection is provided.

Related Item

- Public Input No. 30-NFPA 780-2023

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

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Submittal Date: Sun May 12 11:53:50 EDT 2024

Committee: LIG-AAA



Public Comment No. 24-NFPA 780-2024 [Section No. 11.4.2.5]

11.4.2.5

Reinforcing steel, where used as part of the light base installation, shall be bonded to the metallic light base using a minimum 6 AWG bare solid copper or 40% CCS conductor.

Statement of Problem and Substantiation for Public Comment

This adds 40% CCS as an alternative for this application.

Related Item

- Public Input No. 31-NFPA 780-2023

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

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Submittal Date: Sun May 12 11:58:28 EDT 2024

Committee: LIG-AAA



Public Comment No. 25-NFPA 780-2024 [Section No. 11.4.2.6.2.2]

11.4.2.6.2.2*

Each light base or mounting stake shall be provided with a grounding electrode in accordance with one of the following methods:

- (1) Where a metallic light base is used, the grounding electrode shall be bonded to the metallic light base or mounting stake with a minimum 6 AWG bare, annealed, or soft drawn, solid copper or 40% CCS conductor.
- (2) Where a nonmetallic light base is used, the grounding electrode shall be bonded to the metallic light fixture or metallic base plate with a minimum 6 AWG bare, annealed, or soft drawn, solid copper or 40% CCS conductor.

Statement of Problem and Substantiation for Public Comment

This adds 40% CCS as an alternative for this application.

Related Item

- Public Input No. 32-NFPA 780-2023

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

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Submittal Date: Sun May 12 12:00:33 EDT 2024

Committee: LIG-AAA



Public Comment No. 26-NFPA 780-2024 [Section No. 11.4.6 [Excluding any Sub-Sections]]

A minimum 6 AWG stranded copper or 40% CCS green insulated bonding jumper shall be installed between the following items:

- (1) In-pavement airfield lighting fixture and the metallic light base
- (2) Elevated fixture base plate and metallic light base
- (3) Surge arresters and metallic light base

Statement of Problem and Substantiation for Public Comment

This adds 40% CCS as an alternative for this application.

Related Item

- Public Input No. 33-NFPA 780-2023

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

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Submittal Date: Sun May 12 12:03:01 EDT 2024

Committee: LIG-AAA



Public Comment No. 4-NFPA 780-2024 [Section No. A.4.1.1.1]

A.4.1.1.1 [🔗](#)

Main-size lightning conductors are not manufactured to standard American Wire Gauge (AWG) sizes. Bare AWG conductors are not typically “listed for the purpose” for lightning protection by any listing authority. Table A.4.1.1.1 provides comparisons between lightning protection conductors and the closest AWG sizes from Table 8 in Chapter 9 of *NFPA 70*.

Table A.4.1.1.1 Lightning Protection Conductors

<u>Lightning Conductor</u>	<u>Area</u>
Class I main-size copper <u>or 40% copper-clad steel</u> lightning conductor	57,400 cir. mils
#2 AWG	66,360 cir. mils
#3 AWG	52,620 cir. mils
Class I main-size aluminum lightning conductor	98,600 cir. mils
#1 AWG	83,690 cir. mils
#1/0 AWG	105,600 cir. mils
Class II main-size copper <u>or 40% copper-clad steel</u> lightning conductor	115,000 cir. mils
#1/0 AWG	105,600 cir. mils
#2/0 AWG	133,100 cir. mils
Class II main-size aluminum lightning conductor	192,000 cir. mils
#3/0 AWG	167,800 cir. mils
#4/0 AWG	211,600 cir. mils
Lightning bonding conductor	-
Copper <u>Copper or 40% copper-clad steel</u>	26,240 cir. mils
#6 AWG	26,240 cir. mils
Lightning bonding conductor	-
Aluminum	41,100 cir. mils
#4 AWG	41,740 cir. mils

Statement of Problem and Substantiation for Public Comment

This adds 40% CCS to the table along with copper (CU) as an acceptable alternative material type. History of usage as a conductor material employed in lightning protection applications, and the laboratory work of the CCS 780 Task Group has provided sufficient evidence that 40% CCS meets the minimum requirements for performance.

Related Item

- Public Input 34 NFPA 780

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

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Submittal Date: Sun May 12 08:25:33 EDT 2024

Committee: LIG-AAA



Public Comment No. 7-NFPA 780-2024 [Section No. A.4.2.5]

A.4.2.5

Aluminum, ~~copper~~ and ~~copper~~ on 40% CCS on any structure must be designed and installed to ensure compatibility such that the expected lifecycle for any given component can be realized. The AHJ or building owner must have a thorough understanding of these compatibility issues.

Statement of Problem and Substantiation for Public Comment

This adds 40% CCS to the table along with copper (CU) as an acceptable alternative material type. History of usage as a conductor material employed in lightning protection applications, and the laboratory work of the CCS 780 Task Group has provided sufficient evidence that 40% CCS meets the minimum requirements for performance.

Related Item

- Public Input 14 NFPA 780 2023

Submitter Information Verification

Submitter Full Name: Peter Graser

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Submittal Date: Sun May 12 08:40:44 EDT 2024

Committee: LIG-AAA



Public Comment No. 12-NFPA 780-2024 [Section No. A.4.12.3.2]

A.4.12.3.2

Field experience has demonstrated that a copper or 40% CCS conductor could experience accelerated corrosion at the point where the copper or 40% CCS conductor exits the concrete. Concrete and soil composition could have a direct impact on the amount of corrosion, if any. Investigation of existing installations at the proposed site or chemical analysis of the concrete and soil composition would provide a basis to determine if additional corrosion protection is warranted. Each installation should be evaluated to determine the need for any additional corrosion protection. Tinned copper or 40% CCS conductors or installation of a nonmetallic sleeve over the conductor where the conductor exits the concrete are two methods that could mitigate corrosion. The nonmetallic sleeve should extend 6 in. (150 mm) on each side of the transition from concrete to soil. See Sections 4.2 and 4.3 for additional requirements.

Statement of Problem and Substantiation for Public Comment

40% CCS is added to the section as the criteria for a copper concrete-encased electrode is the same for 40% CCS.

Related Item

- Public Input No. 18-NFPA 780-2023

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

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Submittal Date: Sun May 12 09:20:59 EDT 2024

Committee: LIG-AAA



Public Comment No. 37-NFPA 780-2024 [Section No. A.4.15.2.5.1]

A.4.15.2.5.1 [🔗](#)

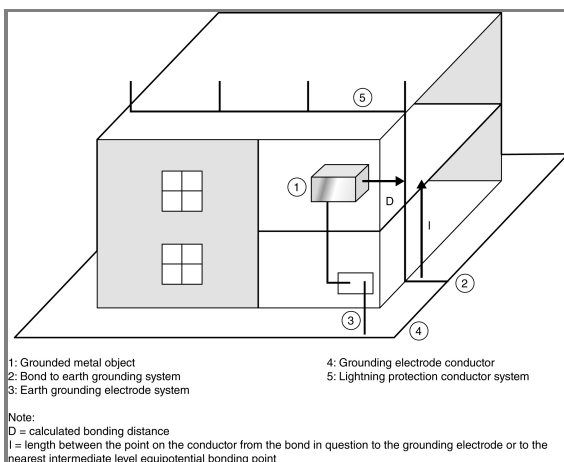
See Figure A.4.15.2.5.1 for an illustration of bonding distance.

Figure A.4.15.2.5.1 Illustration of Bonding Distance.

3. Grounding Electrode(also should this have a ground symbol like others in the standard?)

4. Loop Conductor

5. Lightning Protection Main Conductor



Statement of Problem and Substantiation for Public Comment

The terms in the diagram A.4.15.2.5.1 should be the same as terms used in the definitions.

Related Item

- Public Input No. 109

Submitter Information Verification

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Submittal Date: Thu May 30 11:09:55 EDT 2024

Committee: LIG-AAA



Public Comment No. 23-NFPA 780-2024 [Section No. A.11.4.1.2]

A.11.4.1.2 [🔗](#)

Corrosion, oxidation, chemical reaction, and electrolysis can all be considered adverse effects on a bare copper or 40% CCS counterpoise conductor. Most metals are subject to some form of corrosion, oxidation, chemical reaction, or electrolysis. Where the history of grounding systems (buried conductors, buried metallic objects) in the area is not known, a soil resistivity and soil pH profile in conjunction with the consultation of a materials/corrosion specialist could be necessary to properly design the grounding system. If stainless steel is to be used it should be a minimum of 154,000 CM (78 mm²) corresponding to approximately 3/8 in. (9.5 mm) diameter.

Statement of Problem and Substantiation for Public Comment

This adds 40% CCS to the section and annex materials to ensure equivalent corrosion protection is provided.

Related Item

- Public Input No. 30-NFPA 780-2023

Submitter Information Verification

Submitter Full Name: Peter Graser

Organization: Copperweld Bimetallics, LLC.

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Submittal Date: Sun May 12 11:56:07 EDT 2024

Committee: LIG-AAA



Public Comment No. 38-NFPA 780-2024 [Section No. L.6.6.1.4]

L.6.6.1.4

The annual threat of occurrence due to flashes to an adjacent structure (N_{DJ}) at the end of an incoming service can be estimated using the following equation:

$$A_{DJ} = LW + 6H(L + W) + 9\pi H^2$$

The existing equation for NDJ should be returned. Replaciing it with the equation for the area makes no sense. It is a nimber, not an area!

[L.6.6.1.4]

For additional details, see also L.4.1.1.

Statement of Problem and Substantiation for Public Comment

The existing equation for NDJ should be returned. Replacing it with the equation for the area makes no sense. It is a number, not an area!

Related Item

- FR71

Submitter Information Verification

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Submittal Date: Thu May 30 14:08:17 EDT 2024

Committee: LIG-AAA



Public Comment No. 36-NFPA 780-2024 [Section No. N.6]

N.6 LEMP Mitigation.

~~† Under appropriate engineering supervision, it~~ might be advantageous to employ a level of protection applicable to the threat, such as a faraday-like approach coordinated with bonding, grounding, and transient suppression systems, to reduce electromagnetic field effects and to mitigate coupling of LEMP onto conductive masses and conductors on and in a tank.

Statement of Problem and Substantiation for Public Comment

The section offers a set of guidelines that may or may not be applicable to each installation. The protection of plastic storage tanks is not a one size fits all solution, so the added language is intended to make the user aware that specific engineering for each installation should be considered.

Related Item

- Public Input No. 54

Submitter Information Verification

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Submittal Date: Thu May 30 10:20:52 EDT 2024

Committee: LIG-AAA



Public Comment No. 29-NFPA 780-2024 [Section No. O.1.2.6]

O.1.2.6 ~~UL~~ ULSE Publications.

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

UL Standards & Engagement 1603 Orrington Ave., Suite 2000 Evanston, IL 60201

UL 497, *Protectors for Paired-Conductor Communications Circuits*, 2001, revised 2022.

UL 497A, *Secondary Protectors for Communications Circuits*, 2001, revised 2019.

UL 497B, *Protectors for Data Communications and Fire-Alarm Circuits*, 2004, revised 2022.

UL 497C, *Protectors for Coaxial Communications Circuits*, 2001, revised 2022.

UL 497D, *Outline of Investigation for Component Secondary Protectors for Communications Circuits Used with Specified Voltage Suppression*, 2007.

UL 497E, *Outline of Investigation for Protectors for Antenna Lead-In Conductors*, 2011.

UL 1449, *Surge Protective Devices*, 2021, revised 2022.

Statement of Problem and Substantiation for Public Comment

The source for UL Publications has changed to UL Standards & Engagement 1603 Orrington Ave., Suite 2000 Evanston, IL 60201

Related Item

- FR-53

Submitter Information Verification

Submitter Full Name: David Gerstetter

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Submittal Date: Mon May 20 13:30:47 EDT 2024

Committee: LIG-AAA