M.4 Lightning Safety for Outdoor Workers.

M.4.1 Detection. Lightning conditions are to be monitored continuously. In most cases, a combination of a lightning network subscription service, a professional-grade lightning warning system, and a high-quality handheld detector is suggested. However, if thunder is heard, the danger from lightning is close enough to suspend operations and seek refuge.

M.4.2 Notification.

M.4.2.1 Suspension and resumption of work activities should be planned in advance, through policies and training. Information can be transmitted by some or all of the following methods:

(1) Sirens
(2) Strobe lights
(3) Text messages
(4) 2-way radios
(5) Telephones

M.4.2.2 A conservative warning threshold could be the following:

Yellow condition: Lightning is in the 20–40 mi (30–60 km) range and the threat could exist.

Orange condition: Lightning is in the 10–20 mi (16–30 km) range and the threat is nearby.

Red Alert: Lightning is in the 0–10 mi (0–16 km) range and no personnel are allowed outdoors. All outside personnel must seek safety in a designated shelter that is equipped with a lightning protection system that complies with this standard. If not available, seek shelter in the structures listed in M.2.2.

M.4.3 Reassess the Threat. Wait until one-half hour after thunder is no longer heard before resuming outdoor activities. Be extra cautious during this storm phase, as lightning can still be a significant hazard.

M.4.4 Policies, Procedures, Education, and Training. Organizations should create, publish, and train personnel on appropriate lightning safety guidelines in accordance with the recommendations in Annex M.

M.5 Lightning Strike Victims.

M.5.1 Individuals who have been struck by lightning do not carry an electrical charge and are safe to assist. If you are qualified, administer first aid and/or CPR immediately. Get emergency help immediately.

▲ Annex N Reserved

▲ Annex O Informational References

O.1 Referenced Publications. The documents or portions thereof listed in this annex are referenced within the informational sections of this standard and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

O.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 70®, National Electrical Code®, 2014 edition.

NFPA 70B, *Recommended Practice for Electrical Equipment Maintenance*, 2013 edition.

NFPA 70E®, Standard for Electrical Safety in the Workplace®, 2012 edition.

NFPA 302, *Fire Protection Standard for Pleasure and Commercial Motor Craft*, 2010 edition.

NFPA 407, *Standard for Aircraft Fuel Servicing*, 2012 edition.

NFPA 410, *Standard on Aircraft Maintenance*, 2010 edition.

O.1.2 Other Publications.

O.1.2.1 API Publications. American Petroleum Institute, 1220 L Street, NW, Washington, DC 20005-4070.

API RP 545, *Recommended Practice for Lightning Protection of Aboveground Storage Tanks for Flammable or Combustible Liquids*, October 2009.

API 650, *Welded Steel Tanks for Oil Storage*, November 1998; Errata, April 2007.

O.1.2.2 Federal Aviation Administration (FAA) Publications. U.S. Department of Transportation, Subsequent Business Office, Ardmore East Business Center, 3341 Q 75th Avenue, Landover, MD 20785. FAA Advisory Circulars are also available at http://www.faa.gov/airports/resources/advisory_circulars/.

FAA Advisory Circular 150/5340-30F, *Design and Installation Details for Airport Visual Aids*, September 29, 2011.

FAA Advisory Circular 150/5345-42F, *Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories*, October 17, 2006.

O.1.2.3 IEC Publications. International Electrotechnical Commission, 3, rue de Varembé, P.O. Box 131, CH-1211 Geneva 20, Switzerland.

IEC 62305-2, *Protection Against Lightning — Part 2: Risk Management*, Edition 2, 2010.

IEC 62305-3, *Protection Against Lightning — Part 3: Physical Damage to Structures and Life Hazard*, Edition 2, 2010.

IEC 62305-4, *Protection Against Lightning — Part 4: Electrical and Electronic Systems Within Structures*, Edition 2, 2010.

O.1.2.4 Military Publications. The following military standard is available from Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120; Headquarters, Army Material Command Code DRXAM-ABS, Alexandria, VA; or Air Force Publications Center, Baltimore, MD.

MIL-STD-464C, *Interface Standard Electromagnetic Environmental Effects Requirements for Systems*, 2010.

O.1.2.5 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

ANSI/UL 96, *Standard for Lightning Protection Components*, 2005.

ANSI/UL 467, *Grounding and Bonding Equipment*, 2007.

ANSI/UL 1449, *Standard for Safety for Transit Voltage Surge Suppressors*, 2nd Edition, 1996.

ANSI/UL 1449, *Standard for Surge Protective Devices*, 2006, with revisions through July 11, 2012.

O.1.2.6 Other Publications. López, R. E., and L. R. Holle. "Lightning Casualties and Damages in the United States from 1959 to 1994," *Journal of Climate*, 13 Issue 19 (October 2000): 3448–3464.

Moore, C. B., W. Rison, J. Mathis, and G. Aulich. "Lightning Rod Improvement Studies," *Journal of Applied Meteorology*, 39:593–609.

O.2 Informational References. The following documents or portions thereof are listed here as informational resources only. They are not a part of the requirements of this document.

O.2.1 IEC Publications. International Electrotechnical Commission, 3, rue de Varembé, P.O. Box 131, CH-1211 Geneva 20, Switzerland.

IEC 61400-24, *Wind Turbines — Part 24: Lightning Protection*, 2010.

IEC 61643-11, *Low-Voltage Surge Protective Devices — Part 11: Surge Protective Devices Connected to Low-Voltage Power Distribution Systems — Requirements and Test Methods*, 2011.

IEC 61643-12, *Low-Voltage Surge Protective Devices — Part 12: Surge Protective Devices Connected to Low-Voltage Power Distribution Systems — Selection and Application Principles*, 2008.

IEC 61643-21, *Low Voltage Surge Protective Devices — Part 21: Surge Protective Devices Connected to Telecommunications and Signalling Networks — Performance Requirements and Testing Methods*, Edition 1.1, 2009.

IEC 61643-22, *Low Voltage Surge Protective Devices — Part 22: Surge Protective Devices Connected to Telecommunications and Signalling Networks — Selection and Application Principles*, 2004.

IEC 62305-1, *Protection Against Lightning — Part 1: General Principles*, Edition 2, 2010.

O.2.2 IEEE Publications. Institute of Electrical and Electronics Engineers, Three Park Avenue, 17th Floor, New York, NY 10016-5997.

ANSI/IEEE C62.41.1, *Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits*, 2002.

ANSI/IEEE C62.41.2, *Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits*, 2002.

ANSI/IEEE C62.45, *IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits*, 2002.

ANSI/IEEE 1100, *Recommended Practice for Powering and Grounding Electronic Equipment (Emerald Book)*, 2005.

IEEE 0093-9994/1100-0465, *Protection Zone for Buildings Against Lightning Strokes Using Transmission Protection Practices*, R. H. Lee, 1978.

IEEE 80, *IEEE Guide for Safety in AC Substation Grounding*, 2000.

IEEE 141, *IEEE Recommended Practice for Electric Power Distribution for Industrial Plants*, 1993.

O.2.3 Military Publications. The following military standards and handbooks are available from Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120; Headquarters, Army Material Command Code DRXAM-ABS, Alexandria, VA; or Air Force Publications Center, Baltimore, MD.

AFMAN 91-201, *Explosive Safety Standards*, Department of Air Force, Washington, DC, January 2011.

AMCR 385-100, *Safety Manual*, Army Material Command, Washington, DC, 1995.

DoDM 6055.09-M, *DoD Ammunition and Explosives Safety Standards: Explosives Safety Construction Criteria, Attachment 4*, Department of Defense, Washington, DC, 2008.

MIL-HDBK-419A, *Grounding, Bonding and Surge Suppression*, Volumes I and II, Department of Defense, Washington, DC, December 1987.

NAVSEA OP-5, *Ammunition and Explosives Ashore*, Volume 1, Revision 7, Chapter 6, Naval Sea Systems Command, Washington, DC, March 2011.

Tobias, J. M., ed., *The Basis of Conventional Lightning Protection Technology*, Federal Interagency Lightning Protection Group, available at www.stinet.dtic.mil, Report No. ADA396784, p. 21, June 2001.

O.2.4 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

ANSI/UL 497, *Standard for Protectors for Paired Conductor Communications Circuits*, 7th Edition, 2001.

ANSI/UL 497A, *Standard for Secondary Protectors for Communications Circuits*, 3rd Edition, 2001.

ANSI/UL 497B, *Standard for Protectors for Data Communications and Fire Alarm Circuits*, 4th Edition, 2004.

ANSI/UL 497C, *Standard for Protectors for Coaxial Communications Circuits*, 2nd Edition, 2001.

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

O.2.5 Other Publications.

Cotton, I., and N. Jenkins. "Lightning Protection of Wind Turbines, Lightning Protection 98, Buildings, Structures and Electronic Equipment," International Conference and Exhibition, Paper 6.1, Solihull, West Midlands, UK, May 6–7, 1998.

D'Alessandro, and F., M. Havelka. "Electrical Grounding of Wind Turbines," EEA Annual Conference, Auckland, New Zealand, June 17–18, 2005.

O.3 References for Extracts in Informational Sections. (Reserved)

Index

-A-

Administration ..... Chap. 1
Listed, Labeled, or Approved Components 1.3
Maintenance 1.6, A.1.6
Mechanical Execution of Work 1.5
Purpose 1.2
Retroactivity 1.4
Scope 1.1
Units of Measurement 1.7
Air Terminal
Definition 3.3.1, A.3.3.1
Aluminum 4.2.2.3
Approved
Definition 3.2.1, A.3.2.1
Authority Having Jurisdiction (AHJ)
Definition 3.2.2, A.3.2.2

-B-

Bonding
Definition 3.3.2

-C-

Cable
Definition 3.3.3, A.3.3.3
Catenary Lightning Protection System
Definition 3.3.4
Chimney
Definition 3.3.5
Combination Waveform Generator
Definition 3.3.6, A.3.3.6
Conductor
Bonding Conductor
Definition 3.3.7.1
Counterpoise Conductor
Definition 3.3.7.2
Definition 3.3.7
Down Conductor
Definition 3.3.7.3
Loop Conductor
Definition 3.3.7.4
Main Conductor
Definition 3.3.7.5, A.3.3.7.5
Roof Conductor
Definition 3.3.7.6
Copper 4.2.2.1
Copper Alloys 4.2.2.2
Copper-Clad Steel
Definition 3.3.8

-D-

Definitions ..... Chap. 3
Discharge Current
Definition 3.3.9
Maximum Discharge Current (I_{max})
Definition 3.3.9.1
Nominal Discharge Current (I_n)
Definition 3.3.9.2

-E-

Explanation of Bonding Principles ..... Annex C
Explanatory Material ..... Annex A

-F-

Fastener
Definition 3.3.10
Flame Protection
Definition 3.3.11
Flammable Air-Vapor Mixtures
Definition 3.3.12, A.3.3.12
Flammable Vapors
Definition 3.3.13
Flash Point
Definition 3.3.14

-G-

Gastight
Definition 3.3.15
General Requirements ..... Chap. 4
Bonding of Metal Bodies 4.16, A.4.16
Grounded Metal Bodies 4.16.2
Structures 40 ft (12 m) and Less in Height 4.16.2.5
Structures More Than 40 ft (12 m) in Height 4.16.2.4
Isolated (Ungrounded) Metallic Bodies 4.16.3, A.4.16.3
Long, Vertical Metal Bodies 4.16.1
Other Structures 4.16.1.3
Reinforced Concrete Structures Where the Reinforcement Is Interconnected and Grounded in Accordance with 4.18.3 ..... 4.16.1.2
Steel-Framed Structures 4.16.1.1
Materials 4.16.4
Common Bonding of Grounded Systems 4.14
General 4.14.1
Concealed Systems 4.18
Concealment in Steel-Reinforced Concrete 4.18.3
General 4.18.1
Grounding Electrodes 4.18.4
Masonry Chimneys 4.18.2
Conductor Fasteners 4.10
Conductors 4.9
Conductor Bends 4.9.5
Conductor Supports 4.9.6
Cross-Run Conductors 4.9.8
Dead Ends 4.9.2
Down Conductors 4.9.9
Down Conductors and Structural Columns 4.9.13
Down Conductors Entering Corrosive Soil 4.9.12
Down Conductors in Nonmetallic Enclosures 4.9.14
Number of Down Conductors 4.9.10
One-Way Path 4.9.1
Protecting Down Conductors 4.9.11
Roof Conductors 4.9.7
Substitution of Main Conductor 4.9.3
"U" or "V" Pockets 4.9.4
Connector Fittings 4.12
Corrosion Protection 4.3
Connectors and Fittings 4.3.3
General 4.1
Material Class Requirements 4.1.1
Grounding Electrodes 4.13
Combinations 4.13.7
Concrete-Encased Electrodes 4.13.3

General 4.13.1
Ground Ring Electrode 4.13.4
Ground Rods 4.13.2, A.4.13.2
Ground Rod Depth 4.13.2.3
Multiple Ground Rods 4.13.2.4, A.4.13.2.4
Grounding Electrode Selection Criteria 4.13.8
Sandy Soil Conditions 4.13.8.2
Shallow Topsoil 4.13.8.1, A.4.13.8.1
Plate Electrode or Ground Plate Electrode 4.13.6, A.4.13.6
Radials 4.13.5, A.4.13.5
Masonry Anchors 4.11
Materials 4.2
Mechanical Damage or Displacement 4.4
Metal Antenna Masts and Supports 4.17
Potential Equalization 4.15
Ground-Level Potential Equalization 4.15.1
Intermediate-Level Potential Equalization 4.15.3
Other Structures 4.15.3.3
Reinforced Concrete Structures Where the Reinforcement Is Interconnected and Grounded in Accordance with 4.18.3 ..... 4.15.3.2
Steel-Framed Structures 4.15.3.1
Materials 4.15.4
Roof-Level Potential Equalization 4.15.2, A.4.15.2
Strike Termination Devices 4.6
Air Terminals 4.6.2
Air Terminal Support 4.6.2.2
Ornaments 4.6.2.3
General 4.6.1
Isolated Masts and Overhead Ground Wires 4.6.5, A.4.6.5
Lightning Protection Masts 4.6.3
Overhead Ground Wires 4.6.4
Strike Termination Devices on Roofs 4.7
Chimneys, Vents, and Other Objects on Roofs Not in a Zone of Protection 4.7.11, A.4.7.11
Domed or Rounded Roofs 4.7.10
Dormers 4.7.7, A.4.7.7
Flat or Gently Sloping Roof Area 4.7.5
Flat or Gently Sloping Roofs with Irregular Perimeters 4.7.6
Location of Devices 4.7.2, A.4.7.2
Metal Roof Top Units 4.7.12
Movable or Rotating Objects on Roofs 4.7.13, A.4.7.13
Open Areas in Flat Roofs 4.7.9
Pitched Roof Areas 4.7.3
Roof Types 4.7.1
Roofs with Intermediate Ridges 4.7.4
Strike Termination Devices Installed on Vertical Roof Members 4.7.8
Structural Metallic Systems 4.19
Bonding Connections 4.19.5
Connections to Framework 4.19.3
General 4.19.1
Grounding Electrodes 4.19.4
Strike Termination Devices 4.19.2
Surge Protection 4.20
Communications Surge Protection 4.20.6
Utility-Owned Communication Equipment 4.20.6.5
Earth Grounding Electrode 4.20.8, A.4.20.8
Facility ac Surge Protection 4.20.5, A.4.20.5
General 4.20.1, A.4.20.1
Installation 4.20.7
Measured Limiting Voltage of an SPD 4.20.4, A.4.20.4
Physical Characteristics 4.20.9
Surge Protection Requirements 4.20.2, A.4.20.2
Surge Protective Device Ratings 4.20.3
Electrical Power Circuits 4.20.3.1, A.4.20.3.1
Signal, Data, and Communication Protection 4.20.3.2
Use of Aluminum 4.5
Zones of Protection 4.8
Multiple-Level Roofs 4.8.2
Rolling Sphere Method 4.8.3
Ground Measurement Techniques ..... Annex E
Grounded (Grounding)
Definition 3.3.16
Grounding Electrode
Definition 3.3.17
Guide for Personal Safety from Lightning ..... Annex M

-H-

Hazard Division 1.4
Definition 3.3.18
Headwall
Definition 3.3.19
Heavy-Duty Stack
Definition 3.3.20

-I-

Informational References ..... Annex O
Inspection and Maintenance of Lightning Protection Systems ..... Annex D
ISO Container
Definition 3.3.21

-L-

Labeled
Definition 3.2.3
Light Base
Definition 3.3.22, A.3.3.22
Lightning Electromagnetic Impulse (LEMP)
Definition 3.3.23
Lightning Protection System
Definition 3.3.24, A.3.3.24
Lightning Risk Assessment ..... Annex L
Liquid
Class I Flammable Liquid
Definition 3.3.25.1
Combustible Liquid
Definition 3.3.25.2
Definition 3.3.25
Listed
Definition 3.2.4, A.3.2.4

-M-

Magazine
Definition 3.3.26
Earth-Covered Magazine (ECM)
Definition 3.3.26.1
Portable Magazine
Definition 3.3.26.2
Magnetically Shielded
Definition 3.3.27
Materials
Class I Materials
Definition 3.3.28.1, A.3.3.28.1
Class II Materials
Definition 3.3.28.2, A.3.3.28.2
Definition 3.3.28
Explosive Materials
Definition 3.3.28.3
Mounting Stake
Definition 3.3.29, A.3.3.29

-P-

Pavement
Definition 3.3.30
Full Strength Pavement
Definition 3.3.30.1
Shoulder Pavement
Definition 3.3.30.2
Principles of Lightning Protection ..... Annex B

Protection for Airfield Lighting Circuits ..... Chap. 11
Application 11.2
General 11.1
Installation of Airfield Lighting Counterpoise System 11.4
Bend Radius 11.4.9
Bonding Jumpers 11.4.6
Connection Requirements 11.4.8
Counterpoise Conductor 11.4.1, A.11.4.1
Counterpoise Conductor Interconnections 11.4.4
Counterpoise Conductor Location 11.4.2
Grounding Electrodes 11.4.5
Metallic Light Base Grounding 11.4.7, A.11.4.7
Multiple Raceways or Cables in a Common Formation 11.4.3
Purpose 11.3
Protection for Heavy-Duty Stacks ..... Chap. 6
Bonding of Metal Bodies 6.8
Isolated (Ungrounded) Protruding Metal Bodies 6.8.2
Exterior 6.8.2.1
Interior 6.8.2.2
Potential Equalization 6.8.1
Ground Level of Stack 6.8.1.1
Intermediate Levels of Stack 6.8.1.3
Top Level of Stack 6.8.1.2
Conductors 6.4
Down Conductors 6.4.2
General 6.4.1
Fasteners 6.5
General 6.1
Grounding 6.9, A.6.9
Materials 6.2
Corrosion Protection 6.2.2
General 6.2.1
Metal Guy Wires and Cables 6.11
Metal Stacks 6.10
Reinforced Concrete Stacks 6.7
Splices 6.6
Strike Termination Devices 6.3
Air Terminal Heights 6.3.3
Air Terminal Mountings 6.3.4
Steel Hoods 6.3.5
Protection for Livestock in Fields ..... Annex H
Protection for Miscellaneous Structures and Special Occupancies ..... Chap. 5
Air-Inflated Structures 5.5
Concrete Tanks and Silos 5.6
General 5.1
Grain-, Coal-, and Coke-Handling and -Processing Structures 5.3
Guyed Structures 5.7
Masts, Spires, Flagpoles 5.2
Metal Towers and Tanks 5.4
Roof Top Helipads 5.8
Protection for Parked Aircraft ..... Annex I
Protection for Picnic Grounds, Playgrounds, Ball Parks, and Other Open Places ..... Annex G
Protection for Solar Arrays ..... Chap. 12
Fundamental Principles of Protection 12.2
General 12.1
Grounding 12.5
Ground-Mounted Systems 12.5.1
Roof-Mounted Systems 12.5.2
Protection of Electrical and Mechanical Systems 12.4
Surge Protection 12.4.2
Maximum Continuous Operating Voltage (MCOV) 12.4.2.4
Short Circuit Current Rating 12.4.2.5
Voltage Protection Rating (VPR) 12.4.2.6
Strike Termination Devices 12.3
Protection for Structures Containing Flammable Vapors, Flammable Gases, or Liquids That Can Give Off Flammable Vapors ..... Chap. 7
Fundamental Principles of Protection 7.2
Protection of Specific Classes of Structures 7.4
Aboveground Tanks at Atmospheric Pressure Containing Flammable Vapors or Liquids That Give Off Flammable Vapors 7.4.1
Bypass Conductors 7.4.1.3, A.7.4.1.3
External Floating Roof Tanks 7.4.1.2, A.7.4.1.2
Shunt Description 7.4.1.2.2
Shunt Placement 7.4.1.2.1
Fixed Roof Tanks (Metallic) and Tanks with Internal Floating Roofs 7.4.1.1, A.7.4.1.1
Grounding Tanks 7.4.1.7
Insulation of Gauge or Guide Poles 7.4.1.5
Metallic Tanks with Nonmetallic Roofs 7.4.1.6
Parallel Conducting Paths (Seal Assembly from the Floating Roof Tank) 7.4.1.4
Earthen Containers at Atmospheric Pressure Containing Flammable Vapors or Liquids That Give Off Flammable Vapors 7.4.2
Protective Measures 7.3
Materials and Installation 7.3.1
Zone of Protection for Masts and Overhead Ground Wires 7.3.2
Alternative Grounding Methods 7.3.2.7
Overhead Ground Wire 7.3.2.6
Reduction of Damage 7.1
Application 7.1.1, A.7.1.1
Protection for Trees ..... Annex F
Protection for Watercraft ..... Chap. 10
Conductors 10.4
Bonding Conductor 10.4.2
Conductor System 10.4.4
Connecting Fittings 10.4.6
Joints 10.4.5
Loop Conductor 10.4.3
Main Conductor 10.4.1
General 10.1
Grounding 10.5
Galvanic Corrosion Protection 10.5.5, A.10.5.5
Main Grounding Electrode 10.5.3
Supplemental Grounding Electrode 10.5.4
Watercraft with Metal Hulls 10.5.1
Watercraft with Nonmetallic Hulls 10.5.2
Materials 10.2
Corrosion 10.2.1
Permitted Materials 10.2.2
Strike Termination 10.3
Nonmetallic Masts 10.3.3
Strike Termination Devices 10.3.2
Zone of Protection 10.3.1, A.10.3.1
Protection for Wind Turbines ..... Chap. 9
Fundamental Principle of Protection 9.2
General 9.1, A.9.1
Grounding 9.4
Protection of Electrical and Mechanical Control Systems 9.3
Protection of Structures Housing Explosive Materials ..... Chap. 8
Application 8.1
Bonding 8.5
Access Doors 8.5.5
Direct Bonding Techniques 8.5.4
General 8.5.1
Isolated Metallic Masses 8.5.3
Metallic Barricades or Bollards 8.5.6
Railroad Tracks 8.5.7
Sideflash Distance 8.5.2
General 8.2
Electromagnetic Coupling 8.2.2
Striking Distance 8.2.1

Grounding 8.4
Concrete-Encased Electrodes 8.4.2
Earth Enhancement 8.4.6
General 8.4.1
Ground Plate Electrodes 8.4.5
Ground Ring Electrodes 8.4.3
Radials 8.4.4
Inspection, Testing, and Maintenance 8.10
Maintenance and Inspection 8.9, A.8.9
Metallic Fences 8.8
Bonding 8.8.2
Gates and Gate Posts 8.8.3
Grounding 8.8.1
Protection for Specific Facilities 8.7
Cranes 8.7.3
Earth-Covered Magazines 8.7.1
Metal Portable Magazines 8.7.5, A.8.7.5
Portable Magazine Groups 8.7.5.4
Single Portable Magazines 8.7.5.3
Open Storage Pads 8.7.4
Piers and Wharves 8.7.2, A.8.7.2
Surge Protection 8.6
Types of Lightning Protection 8.3
Integral Lightning Protection Systems 8.3.4, A.8.3.4
Metallic (Faraday-Like) Cage 8.3.1, A.8.3.1
Overhead Wire (Catenary) Systems 8.3.3
Single or Multiple Masts 8.3.2
Grounding of Masts 8.3.2.2
Mast Lightning Protection System 8.3.2.1, A.8.3.2.1

-R-

Raceway
Definition 3.3.31, A.3.3.31
Referenced Publications ..... Chap. 2
General 2.1
NFPA Publications 2.2
Other Publications 2.3
References for Extracts in Mandatory Sections 2.4

-S-

Shall
Definition 3.2.5
Should
Definition 3.2.6
Sideflash
Definition 3.3.32
Spark Gap
Definition 3.3.33
Standard
Definition 3.2.7
Strike Termination Device
Definition 3.3.34
Striking Distance
Definition 3.3.35
Structure
Definition 3.3.36
Metal-Clad Structure
Definition 3.3.36.1
Metal-Framed Structure
Definition 3.3.36.2
Surge
Definition 3.3.37
Surge Protective Device (SPD)
Definition 3.3.38

-T-

Transient
Definition 3.3.39
Turf
Definition 3.3.40

-V-

Vapor Opening
Definition 3.3.41
Voltage
Definition 3.3.42
Maximum Continuous Operating Voltage (MCOV)
Definition 3.3.42.1
Measured Limiting Voltage (MLV)
Definition 3.3.42.2
Nominal System Voltage
Definition 3.3.42.3
Normal Operating Voltage
Definition 3.3.42.4
Voltage Protection Rating (VPR)
Definition 3.3.43, A.3.3.43

-W-

Watercraft
Definition 3.3.44

-Z-

Zone of Protection
Definition 3.3.45

Sequence of Events Leading to Issuance of This NFPA Committee Document

Step 1: Call for Proposals

- Proposed new Document or new edition of an existing Document is entered into one of two yearly revision cycles, and a Call for Proposals is published.

Step 2: Report on Proposals (ROP)

- Committee meets to act on Proposals, to develop its own Proposals, and to prepare its Report.
- Committee votes by written ballot on Proposals. If two-thirds approve, Report goes forward. Lacking two-thirds approval, Report returns to Committee.
- Report on Proposals (ROP) is published for public review and comment.

Step 3: Report on Comments (ROC)

- Committee meets to act on Public Comments to develop its own Comments, and to prepare its report.
- Committee votes by written ballot on Comments. If two-thirds approve, Report goes forward. Lacking two-thirds approval, Report returns to Committee.
- Report on Comments (ROC) is published for public review.

Step 4: Technical Report Session

- "*Notices of intent to make a motion*" are filed, are reviewed, and valid motions are certified for presentation at the Technical Report Session. ("Consent Documents" that have no certified motions bypass the Technical Report Session and proceed to the Standards Council for issuance.)
- NFPA membership meets each June at the Annual Meeting Technical Report Session and acts on Technical Committee Reports (ROP and ROC) for Documents with "certified amending motions."
- Committee(s) vote on any amendments to Report approved at NFPA Annual Membership Meeting.

Step 5: Standards Council Issuance

- Notification of intent to file an appeal to the Standards Council on Association action must be filed within 20 days of the NFPA Annual Membership Meeting.
- Standards Council decides, based on all evidence, whether or not to issue Document or to take other action, including hearing any appeals.

Committee Membership Classifications

The following classifications apply to Technical Committee members and represent their principal interest in the activity of the committee.

M *Manufacturer:* A representative of a maker or marketer of a product, assembly, or system, or portion thereof, that is affected by the standard.

U *User:* A representative of an entity that is subject to the provisions of the standard or that voluntarily uses the standard.

I/M *Installer/Maintainer:* A representative of an entity that is in the business of installing or maintaining a product, assembly, or system affected by the standard.

L *Labor:* A labor representative or employee concerned with safety in the workplace.

R/T *Applied Research/Testing Laboratory:* A representative of an independent testing laboratory or independent applied research organization that promulgates and/or enforces standards.

E *Enforcing Authority:* A representative of an agency or an organization that promulgates and/or enforces standards.

I *Insurance:* A representative of an insurance company, broker, agent, bureau, or inspection agency.

C *Consumer:* A person who is, or represents, the ultimate purchaser of a product, system, or service affected by the standard, but who is not included in the *User* classification.

SE *Special Expert:* A person not representing any of the previous classifications, but who has a special expertise in the scope of the standard or portion thereof.

NOTES:
1. "Standard" connotes code, standard, recommended practice, or guide.
2. A representative includes an employee.
3. While these classifications will be used by the Standards Council to achieve a balance for Technical Committees, the Standards Council may determine that new classifications of members or unique interests need representation in order to foster the best possible committee deliberations on any project. In this connection, the Standards Council may make appointments as it deems appropriate in the public interest, such as the classification of "Utilities" in the National Electrical Code Committee.
4. Representatives of subsidiaries of any group are generally considered to have the same classification as the parent organization.

Submitting Public Input / Public Comment through the Electronic Submission System (e-Submission):

As soon as the current edition is published, a Standard is open for Public Input.

Before accessing the e-Submission System, you must first sign-in at www.NFPA.org. *Note: You will be asked to sign-in or create a free online account with NFPA before using this system*:

a. Click in the gray Sign In box on the upper left side of the page. Once signed-in, you will see a red "Welcome" message in the top right corner.
b. Under the Codes and Standards heading, Click on the Document Information pages (List of Codes & Standards), and then select your document from the list or use one of the search features in the upper right gray box.

OR

a. Go directly to your specific document page by typing the convenient short link of www.nfpa.org/document#, (Example: NFPA 921 would be www.nfpa.org/921) Click in the gray Sign In box on the upper left side of the page. Once signed in, you will see a red "Welcome" message in the top right corner.

To begin your Public Input, select the link The next edition of this standard is now open for Public Input (formally "proposals") located on the Document Information tab, the Next Edition tab, or the right-hand Navigation bar. Alternatively, the Next Edition tab includes a link to Submit Public Input online

At this point, the NFPA Standards Development Site will open showing details for the document you have selected. This "Document Home" page site includes an explanatory introduction, information on the current document phase and closing date, a left-hand navigation panel that includes useful links, a document Table of Contents, and icons at the top you can click for Help when using the site. The Help icons and navigation panel will be visible except when you are actually in the process of creating a Public Input.

Once the First Draft Report becomes available there is a Public comment period during which anyone may submit a Public Comment on the First Draft. Any objections or further related changes to the content of the First Draft must be submitted at the Comment stage.

To submit a Public Comment you may access the e-Submission System utilizing the same steps as previous explained for the submission of Public Input.

For further information on submitting public input and public comments, go to: http://www.nfpa.org/publicinput

Other Resources available on the Doc Info Pages

Document information tab: Research current and previous edition information on a Standard

Next edition tab: Follow the committee's progress in the processing of a Standard in its next revision cycle.

Technical committee tab: View current committee member rosters or apply to a committee

Technical questions tab: For members and Public Sector Officials/AHJs to submit questions about codes and standards to NFPA staff. Our Technical Questions Service provides a convenient way to receive timely and consistent technical assistance when you need to know more about NFPA codes and standards relevant to your work. Responses are provided by NFPA staff on an informal basis.

Products/training tab: List of NFPA's publications and training available for purchase.

Community tab: Information and discussions about a Standard

Information on the NFPA Standards Development Process

I. Applicable Regulations. The primary rules governing the processing of NFPA standards (codes, standards, recommended practices, and guides) are the NFPA *Regulations Governing the Development of NFPA Standards (Regs)*. Other applicable rules include NFPA *Bylaws*, NFPA *Technical Meeting Convention Rules*, NFPA *Guide for the Conduct of Participants in the NFPA Standards Development Process*, and the NFPA *Regulations Governing Petitions to the Board of Directors from Decisions of the Standards Council*. Most of these rules and regulations are contained in the *NFPA Standards Directory*. For copies of the *Directory*, contact Codes and Standards Administration at NFPA Headquarters; all these documents are also available on the NFPA website at "www.nfpa.org."

The following is general information on the NFPA process. All participants, however, should refer to the actual rules and regulations for a full understanding of this process and for the criteria that govern participation.

II. Technical Committee Report. The Technical Committee Report is defined as "the Report of the responsible Committee(s), in accordance with the Regulations, in preparation of a new or revised NFPA Standard." The Technical Committee Report is in two parts and consists of the First Draft Report and the Second Draft Report. (See *Regs* at 1.4)

III. Step 1: First Draft Report. The First Draft Report is defined as "Part one of the Technical Committee Report, which documents the Input Stage." The First Draft Report consists of the First Draft, Public Input, Committee Input, Committee and Correlating Committee Statements, Correlating Input, Correlating Notes, and Ballot Statements. (See *Regs* at 4.2.5.2 and Section 4.3) Any objection to an action in the First Draft Report must be raised through the filing of an appropriate Comment for consideration in the Second Draft Report or the objection will be considered resolved. [See *Regs* at 4.3.1(b)]

IV. Step 2: Second Draft Report. The Second Draft Report is defined as "Part two of the Technical Committee Report, which documents the Comment Stage." The Second Draft Report consists of the Second Draft, Public Comments with corresponding Committee Actions and Committee Statements, Correlating Notes and their respective Committee Statements, Committee Comments, Correlating Revisions, and Ballot Statements. (See *Regs* at Section 4.2.5.2 and 4.4) The First Draft Report and the Second Draft Report together constitute the Technical Committee Report. Any outstanding objection following the Second Draft Report must be raised through an appropriate Amending Motion at the Association Technical Meeting or the objection will be considered resolved. [See *Regs* at 4.4.1(b)]

V. Step 3a: Action at Association Technical Meeting. Following the publication of the Second Draft Report, there is a period during which those wishing to make proper Amending Motions on the Technical Committee Reports must signal their intention by submitting a Notice of Intent to Make a Motion. (See *Regs* at 4.5.2) Standards that receive notice of proper Amending Motions (Certified Amending Motions) will be presented for action at the annual June Association Technical Meeting. At the meeting, the NFPA membership can consider and act on these Certified Amending Motions as well as Follow-up Amending Motions, that is, motions that become necessary as a result of a previous successful Amending Motion. (See 4.5.3.2 through 4.5.3.6 and Table1, Columns 1-3 of *Regs* for a summary of the available Amending Motions and who may make them.) Any outstanding objection following action at an Association Technical Meeting (and any further Technical Committee consideration following successful Amending Motions, see *Regs* at 4.5.3.7 through 4.6.5.3) must be raised through an appeal to the Standards Council or it will be considered to be resolved.

VI. Step 3b: Documents Forwarded Directly to the Council. Where no Notice of Intent to Make a Motion (NITMAM) is received and certified in accordance with the Technical Meeting Convention Rules, the standard is forwarded directly to the Standards Council for action on issuance. Objections are deemed to be resolved for these documents. (See *Regs* at 4.5.2.5)

VII. Step 4a: Council Appeals. Anyone can appeal to the Standards Council concerning procedural or substantive matters related to the development, content, or issuance of any document of the Association or on matters within the purview of the authority of the Council, as established by the *Bylaws* and as determined by the Board of Directors. Such appeals must be in written form and filed with the Secretary of the Standards Council (See *Regs* at 1.6). Time constraints for filing an appeal must be in accordance with 1.6.2 of the *Regs*. Objections are deemed to be resolved if not pursued at this level.

VIII. Step 4b: Document Issuance. The Standards Council is the issuer of all documents (see Article 8 of *Bylaws*). The Council acts on the issuance of a document presented for action at an Association Technical Meeting within 75 days from the date of the recommendation from the Association Technical Meeting, unless this period is extended by the Council (See *Regs at* 4.7.2). For documents forwarded directly to the Standards Council, the Council acts on the issuance of the document at its next scheduled meeting, or at such other meeting as the Council may determine (See *Regs* at 4.5.2.5 and 4.7.4).

IX. Petitions to the Board of Directors. The Standards Council has been delegated the responsibility for the administration of the codes and standards development process and the issuance of documents. However, where extraordinary circumstances requiring the intervention of the Board of Directors exist, the Board of Directors may take any action necessary to fulfill its obligations to preserve the integrity of the codes and standards development process and to protect the interests of the Association. The rules for petitioning the Board of Directors can be found in the *Regulations Governing Petitions to the Board of Directors from Decisions of the Standards Council* and in 1.7 of the *Regs*.

X. For More Information. The program for the Association Technical Meeting (as well as the NFPA website as information becomes available) should be consulted for the date on which each report scheduled for consideration at the meeting will be presented. For copies of the First Draft Report and Second Draft Report as well as more information on NFPA rules and for up-to-date information on schedules and deadlines for processing NFPA documents, check the NFPA website (www.nfpa.org/aboutthecodes) or contact NFPA Codes & Standards Administration at (617) 984-7246.

Stay Up-To-Date. Join NFPA® Today!

☑ **YES** Please enroll me as a member of NFPA for the term checked below. Activate all benefits, and ship my *Member Kit* including the *Benefits Guide* and other resources to help me make the most of my NFPA membership.
Please allow three to four weeks for the kit to arrive.

Billing Information:

Name _____ Title _____

Organization _____

Address _____

City _____ State _____ Zip/Postal Code _____

Country _____

Phone _____ E-mail _____

Priority Code: 8J-MIS-1Z

Please Answer The Following Questions:

Job Title *(check one)*

- ❑ Architect, Engineer, Consultant, Contractor (C17)
- ❑ Facilities Safety Officer (F14)
- ❑ Fire Chief, Other Fire Service (A11)
- ❑ Loss Control, Risk Manager (L11)
- ❑ Inspector, Building Official, Fire Marshal (F03)
- ❑ Owner, President, Manager, Administrator (C10)
- ❑ Other (please specify): (G11)_____

Type of Organization *(check one)*

- ❑ Architecture, Engineering, Contracting (A14)
- ❑ Commercial Firm (Office, Retail, Lodging, Restaurant) (G13)
- ❑ Electrical Services, Installation (J11)
- ❑ Fire Service, Public and Private (AA1)
- ❑ Government (C12)
- ❑ Industrial Firm (Factory, Warehouse) (C11)
- ❑ Institutional (Health Care, Education, Detention, Museums) (B11)
- ❑ Insurance, Risk Management (B12)
- ❑ Utilities (G12)
- ❑ Other (please specify): (G11)_____

4 Easy Ways to Join

Fax: 1-800-593-6372, Outside the U.S. +1-508-895-8301
Mail: NFPA Membership Services Center,
11 Tracy Drive, Avon, MA 02322-9908
Online: nfpa.org
Call: 1-800-344-3555
Outside the U.S. call +

Terms and Payment:

- ❑ 1 year ($165)
- ❑ 2 years ($300) SAVE $30
- ❑ 3 years ($430) SAVE $65

Annual membership dues include a $45 subscription to *NFPA Journal*®. Regular membership in NFPA is individual and non-transferable. NFPA Journal is a registered trademark of the National Fire Protection Association, Quincy, MA 02169. Voting privileges begin after 180 days of individual membership. Prices subject to change.

Payment Method:

Check One:

- ❑ Payment Enclosed *(Make check payable to NFPA.)*
- ❑ Purchase Order *(Please attach this form to your P.O.)*
- ❑ Bill Me Later *(Not available on International memberships.)*

Charge My: ❑ VISA ❑ MasterCard ❑ AmEx ❑ Discover

Card #_____

Expiration Date _____

Name on Card _____

Signature _____

International members: Please note prepayment is required on all International orders. Be sure to enclose a check or select your preferred credit card option.

100% Money-Back Guarantee

If anytime during your first year you decide membership is not for you, let us know and you'll
[illegible] refund of your dues.