First Revision No. 43-NFPA 76-2022 [Global Input]

Global: Remove ANSI and “Standard for” from in front of all UL standards referenced in NFPA 76.

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Thu May 26 11:39:46 EDT 2022

Committee Statement

Committee Statement: UL no longer uses ANSI in their title. UL has removed "Standard For" from all of their titles when referencing their documents.

Response Message: FR-43-NFPA 76-2022

Public Input No. 99-NFPA 76-2021 [Global Input]

First Revision No. 57-NFPA 76-2022 [Global Input]

Remove any extract tags that reference 52.2 or 52.3 from NFPA 1 throughout the document.

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Tue Jun 28 08:24:18 EDT 2022

Committee Statement

Committee Statement: Removed any extract tags that reference 52.2 or 52.3 from NFPA 1 throughout the document, as they have been deleted from NFPA 1. The information is still important to NFPA 76 and should remain in the document, but it is no longer extracted text.

Response Message: FR-57-NFPA 76-2022

Public Input No. 107-NFPA 76-2022 [Global Input]

First Revision No. 20-NFPA 76-2022 [Chapter 2]

Chapter 2 Referenced Publications

2.1 General.

The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 1, *Fire Code,* ~~2018~~ 2021 edition.

NFPA 10, *Standard for Portable Fire Extinguishers,* ~~2018~~ 2022 edition.

NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems,* ~~2018~~ 2022 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* ~~2019~~ 2022 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems,* ~~2019~~ 2023 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* ~~2020~~ 2023 edition.

NFPA 30, *Flammable and Combustible Liquids Code,* ~~2018~~ 2021 edition.

NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines,* ~~2018~~ 2021 edition.

NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work,* 2019 edition.

NFPA 54/ANSI Z223.1, *National Fuel Gas Code,* ~~2018~~ 2021 edition.

NFPA 58, *Liquefied Petroleum Gas Code,* ~~2020~~ 2023 edition.

NFPA 70®, National Electrical Code®, ~~2020~~ 2023 edition.

NFPA 72®, National Fire Alarm and Signaling Code®, ~~2019~~ 2022 edition.

NFPA 80, *Standard for Fire Doors and Other Opening Protectives,* ~~2019~~ 2022 edition.

NFPA 80A, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures,* ~~2017~~ 2022 edition.

NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems,* ~~2018~~ 2021 edition.

NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations,* ~~2017~~ 2021 edition.

NFPA *101®, Life Safety Code®,* ~~2018~~ 2021 edition.

NFPA 220, *Standard on Types of Building Construction,* ~~2018~~ 2021 edition.

NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations,* ~~2019~~ 2022 edition.

NFPA 252, *Standard Methods of Fire Tests of Door Assemblies,* ~~2017~~ 2022 edition.

NFPA 257, *Standard on Fire Test for Window and Glass Block Assemblies,* ~~2017~~ 2022 edition.

NFPA 262, *Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces,* ~~2019~~ 2023 edition.

~~NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response,* 2017 edition.~~

NFPA 750, *Standard on Water Mist Fire Protection Systems,* ~~2019~~ 2023 edition.

NFPA 770 *Standard on Hybrid (Water and Inert Gas) Fire-Extinguishing Systems,* 2021 edition.

NFPA 780, *Standard for the Installation of Lightning Protection Systems,* ~~2020~~ 2023 edition.

NFPA 1225 *Standard for Emergency Services Communications,* 2022 edition.

NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems,* ~~2018~~ 2022 edition.

NFPA 5000®, Building Construction and Safety Code®, ~~2018~~ 2021 edition.

2.3 Other Publications.

2.3.1 ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, ~~2018~~ 2021 .

ASTM E814, *Standard Test Method for Fire Tests of Penetration Firestop Systems*, 2013a, reapproved 2017.

ASTM E1537, *Standard Test Method for Fire Testing of Upholstered Furniture*, ~~2016~~ 2022 .

ASTM E1966, *Standard Test Method for Fire Resistive Joint Systems*, ~~2015~~ 2019 .

2.3.2 ATIS Publications.

Alliance for Telecommunications Industry Solutions, 1200 G Street NW, Suite 500, Washington, DC 20005.

ATIS 0600307, *Fire Resistance Criteria — Ignitability Requirements for Equipment Assemblies, Ancillary Non-Metallic Apparatus, and Fire Spread Requirements for Wire and Cable*, ~~2014~~ 2018 .

ATIS 0600319, *Equipment Assemblies — Fire Propagation Risk Assessment Criteria*, 2014.

2.3.3 CSA Group Publications.

CSA Group, 178 Rexdale Boulevard, Toronto, ON M9W 1R3, Canada.

C22.2 No. 0.3, *Test Methods for Electrical Wires and Cables*, ~~2009, revised 2014~~ 2019 .

Global FR-43

2.3.4 UL Publications.

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

~~ANSI/~~UL 44, *Thermoset-Insulated Wires and Cables,* ~~2017~~2020.

~~ANSI/~~UL 83, *Thermoplastic-Insulated Wire and Cables,* ~~2017~~2019.

~~ANSI/~~UL 444, *Communications Cables,* ~~2017~~2021.

~~ANSI/~~UL 568, *Nonmetallic Cable Tray Systems,* ~~2002~~2019.

~~ANSI/~~UL 723, ~~*Standard for*~~ *Test for Surface Burning Characteristics of Building Materials*, 2018.

~~ANSI/~~UL 900, ~~*Standard for*~~ *Air Filter Units*, 2015.

~~ANSI/~~UL 1277, *Electrical Power and Control Tray Cables with Optional Optical-Fiber Members,* ~~2018~~2021.

UL 1479, *Fire Tests of Penetration Firestops* 2015.

~~ANSI/UL 1564, *Standard for Industrial Battery Chargers,* 2015.~~

~~ANSI/~~UL 1651, *Optical Fiber Cable,* ~~2015~~2020.

~~ANSI/~~UL 1666, ~~*Standard*~~ *Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts*, ~~2007~~2021.

~~ANSI/~~UL 1685, ~~*Standard for*~~ *Vertical Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables*, 2015.

~~ANSI/UL 1973 *Standard for Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications*, 2018.~~

~~ANSI/~~UL 2024, *Cable Routing Assemblies and Communications Raceways,* ~~2014, revised 2015~~2021.

UL 2079, *Tests for Fire Resistance of Building Joint Systems*, 2015.

UL 2261, *Outline of Investigation for Cables for Network-Powered Broadband Communications Systems*, 2005.

~~ANSI/UL 9540, *Outline of Investigation for Energy Storage Systems and Equipment,* 2016.~~

~~ANSI/~~UL 60950-1, *Information Technology Equipment — Safety — Part 1: General Requirements,* 2007.

2.3.5 Other Publications.

~~California Technical Bulletin 133, *Flammability Test Procedure for Seating Furniture for Use in Public Occupancies*, State of California, Department of Consumer Affairs, 1625 North Market Boulevard, Suite N-119, Sacramento, CA 95834.~~

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

Telcordia GR-63-CORE, *Network Equipment Building System (NEBS)™ Requirements: Physical Protection*, 2017.

2.4 References for Extracts in Mandatory Sections.

NFPA 1, *Fire Code,* ~~2018~~ 2021 edition.

NFPA 70®, *National Electrical Code®,* ~~2017~~ 2023 edition.

NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems,* ~~2018~~ 2021 edition.

NFPA *101®*, *Life Safety Code®,* ~~2018~~ 2021 edition.

NFPA 805, *Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants,* ~~2015~~ 2020 edition.

NFPA 855, *Standard for the Installation of Stationary Energy Storage Systems*, 2020 edition.

NFPA 921, *Guide for Fire and Explosion Investigations,* ~~2017~~ 2021 edition.

NFPA 5000®, *Building Construction and Safety Code®,* ~~2018~~ 2021 edition.

Supplemental Information

File Name	Description	Approved
FR-20_Chp2_Clean.docx	For staff use only	

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Wed May 25 21:46:31 EDT 2022

Committee Statement

Committee Statement: Reference list updated to included added/ deleted references. Edition years for references were updated, as well.
Response Message: FR-20-NFPA 76-2022

Public Input No. 108-NFPA 76-2022 [Section No. 2.2]

Public Input No. 57-NFPA 76-2021 [Section No. 2.4]

Public Input No. 56-NFPA 76-2021 [Section No. 2.2]

Public Input No. 100-NFPA 76-2021 [Section No. 2.3.4]

Public Input No. 55-NFPA 76-2021 [Section No. 3.3.14]

First Revision No. 48-NFPA 76-2022 [Section No. 3.3.2.1]

3.3.2.1 Lithium-Ion Battery.

A storage battery that consists of lithium-ions imbedded in a carbon graphite or nickel metal oxide substrate. The electrolyte is a carbonate mixture or a gelled polymer. The lithium-ions are the charge carriers of the battery. [**1,**~~2018~~ 2021]

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Fri Jun 03 09:17:19 EDT 2022

Committee Statement

Committee Statement: Revised to align extracted text with the latest edition of NFPA 1.
Response Message: FR-48-NFPA 76-2022

First Revision No. 49-NFPA 76-2022 [Section No. 3.3.2.2]

3.3.2.2 Nickel Cadmium (~~NiCd~~ NiCad) Battery.

An alkaline storage battery in which the positive active material is nickel oxide, the negative contains the cadmium, and the electrolyte is potassium hydroxide. [**1,**~~2018~~ 2021]

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Fri Jun 03 09:19:16 EDT 2022

Committee Statement

Committee Statement: Revised to align the extracted text with the latest edition of NFPA 1.
Response Message: FR-49-NFPA 76-2022

First Revision No. 55-NFPA 76-2022 [Section No. 3.3.4]

3.3.4 Cable Routing Assembly.

A single channel or connected multiple channels, as well as associated fittings, forming a structural system that is used to support and route communications wires and cables, optical fiber cables, data cables associated with information technology and communications equipment, Class 2, Class 3, and Type PLTC cables, and power-limited fire alarm cables in plenum, riser, and general purpose applications. [**70:** ~~100~~ 2023]

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Fri Jun 03 09:54:06 EDT 2022

Committee Statement

Committee Statement: Revised to align the extracted text with the latest edition of NFPA 70. All definitions in NFPA 70 are now located in Article 100, so the article references can be replaced with the edition year.
Response Message: FR-55-NFPA 76-2022

First Revision No. 54-NFPA 76-2022 [Section No. 3.3.7]

3.3.7 Communications Raceway.

An enclosed channel of nonmetallic materials designed expressly for holding communications wires and cables; optical fiber cables; data cables associated with information technology and communication equipment; Class 2, Class 3, and Type PLTC cables; and power-limited fire alarm cables in plenum, riser, and general-purpose applications. [**70:** ~~100~~ 2023]

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Fri Jun 03 09:52:28 EDT 2022

Committee Statement

Committee Statement: Revised to align the extracted text with the latest edition of NFPA 70. All definitions in NFPA 70 are now located in Article 100, so the article references can be replaced with the edition year.
Response Message: FR-54-NFPA 76-2022

First Revision No. 27-NFPA 76-2022 [New Section after 3.3.18]

3.3.19 Thermal Runaway.

Self-heating of an electrochemical system in an uncontrollable fashion. [**855**, 2023]

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Thu May 26 09:30:47 EDT 2022

Committee Statement

Committee Statement: Added the definition of thermal runaway as this term is used in the body of the standard. Renumber subsequent sections.
Response Message: FR-27-NFPA 76-2022

Public Input No. 47-NFPA 76-2021 [New Section after 3.3.18]

First Revision No. 28-NFPA 76-2022 [Section No. 3.3.19]

3.3.20* Utility.

An organization, ~~either~~ designated ~~by~~ or recognized such as by a public service ~~commissions~~ commission or public utility commissions, or recognized as such under federal, state, or local law~~, that installs, operates, and maintains electric supply or communication systems such as, but not limited to, telephone, wireless, VoIP, CATV, internet, satellite, or data service~~ .

A.3.3.20 Utility.

A communications utility installs, operates, and maintains ~~electric supply or communication~~ communications systems such as, but not limited to, telephone, wireless, VoIP, ~~CATV~~ community antenna television (CATV) , internet, satellite, or data service.

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Thu May 26 09:41:22 EDT 2022

Committee Statement

Committee Statement: The definition has been editorially revised moving examples to the annex.
Response Message: FR-28-NFPA 76-2022

Public Input No. 45-NFPA 76-2021 [Section No. 3.3.19]

First Revision No. 1-NFPA 76-2022 [Section No. 6.1.4.1]

6.1.4.1

Telecommunications facilities in multiple tenant buildings not controlled by a telecommunications service provider shall be housed in one of the following:

(1) A building constructed in accordance with NFPA 220 Type I (~~443)~~ 442), Type I (332) ~~or~~ , Type II (222), or Type II (111)

(2) A building provided with an automatic suppression system

(3) A single-story building constructed in accordance with NFPA 220 Type II (000)

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Wed May 25 08:46:19 EDT 2022

Committee Statement

Committee Statement: Building construction types have been revised to align with NFPA 220.
Response Message: FR-1-NFPA 76-2022

Public Input No. 41-NFPA 76-2021 [Section No. 6.1.4.1]

First Revision No. 13-NFPA 76-2022 [Section No. 6.8.4.3]

6.8.4.3

Telecommunications facilities containing less than 232 m^2 (2500 ft^2) of signal-processing equipment areas shall not be required to comply with the requirements of 6.6.1~~, 6.6.1(2) ,~~ and 6.8.4.2.

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Wed May 25 13:42:58 EDT 2022

Committee Statement

Committee Statement: For buildings with a signal processing space less than 2500 square feet, do not need to comply with section 6.6.1(3). The isolation requirement for HVAC systems does not need to apply even if a smoke control system is installed because a small space is considered a single smoke zone.

Response Message: FR-13-NFPA 76-2022

Public Input No. 6-NFPA 76-2020 [Section No. 6.8.4.3]

First Revision No. 2-NFPA 76-2022 [Section No. 6.8.5.6 [Excluding any Sub-Sections]]

Table 6.8.5.6 shall be used to determine fire protection requirements for signal-processing areas where new signal-processing equipment is added.

Table 6.8.5.6 ~~Network Evolution —~~ Fire Protection Requirements~~: Application~~ for a Signal-Processing Hazard Area to Which New Signal-Processing Equipment Is Being Added~~, Resulting in a Signal-Processing Equipment Classification Combination~~

		Required Fire Protection Ele				
Signal-Processing Equipment Combination in Hazard Area	Option	Fire Detection in Compliance with 6.8.6?	Hazard Area Rated Fire Separation?[a]	Combination Fire/Smoke Dampers?[b]	Smoke Management?[c,d]	Sufficie Spatia Separatio
Level A		Yes	Yes	Yes	No	No
Level B~~, Select~~	Option 1	Yes	Yes	Yes	Yes	Yes
	Option 2	Yes	Yes	Yes	No	Yes
	Option 3	Yes	Yes	Yes	No	Yes
Level C		Yes	Yes	Yes	Yes	Yes
Levels A & B~~, Select~~	Option 1	Yes	Yes	Yes	Yes	Yes
	Option 2	Yes	Yes	Yes	No	Yes
	Option 3	Yes	Yes	Yes	No	Yes
Levels A & C		Yes	Yes	Yes	Yes	Yes
Levels B & C		Yes	Yes	Yes	Yes	Yes
Levels A, B, & C		Yes	Yes	Yes	Yes	Yes

Note: Level A — see 8.8.3(1); Level B — see 8.8.3(2); Level C — see 8.8.3(3).

[a]With the addition of new equipment to a hazard area, upgrading of fire separations where they do not exist is provided in order to prevent unacceptable network outages.

[b]Combination fire/smoke dampers are used to prevent fire and smoke damage to other hazard areas.

[c]Smoke management systems are designed for the fires resulting from the selected equipment for the hazard area.

[d]Fire suppression is added to the hazard area if the design fire for the hazard area exceeds smoke management system capabilities to prevent signal-processing equipment damage.

[e]Sufficient spatial separation is provided to prevent fire and smoke damage to telecommunications equipment other than the telecommunications equipment of fire origin.

[f]In-cabinet fire detection in compliance with 6.8.6 and the use of in-cabinet fire suppression can be a more economical method than protection of the entire hazard area.

[g]Selective depowering plan is provided for all options in buildings over 232 m^2 (2500 ft^2). See Section 6.5.

Supplemental Information

File Name	Description	Approved
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Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Wed May 25 09:44:58 EDT 2022

Committee Statement

Committee Statement: Editorial changes to table. A task group has been formed to review this table.
Response Message: FR-2-NFPA 76-2022

Public Input No. 7-NFPA 76-2020 [Section No. 6.8.5.6 [Excluding any Sub-Sections]]

First Revision No. 3-NFPA 76-2022 [Section No. 6.10.8.1.1 [Excluding any Sub-Sections]]

~~Battery systems shall be permitted in the same room as the equipment that they support.~~
[~~1:~~ ~~52.2.2.3.1~~]

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Wed May 25 10:07:02 EDT 2022

Committee Statement

Committee Statement: This content has been removed because it is redundant.
Response Message: FR-3-NFPA 76-2022

Public Input No. 8-NFPA 76-2020 [Section No. 6.10.8.1.1 [Excluding any Sub-Sections]]

First Revision No. 4-NFPA 76-2022 [Section No. 6.10.8.1.1.1]

6.10.8.1.1.1

Battery systems shall be housed in a noncombustible, locked cabinet or other enclosure to prevent access by unauthorized personnel unless located in ~~a separate~~ an equipment room accessible only to authorized personnel.~~[1: 52.2.2.3.2]~~

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Wed May 25 10:12:33 EDT 2022

Committee Statement

Committee Statement: The essential aspect is that the room be restricted. It does not need to be separate and it is not clear what the room is separated from since we earlier state that batteries can be located with the equipment they support. As written, the requirement would only allow batteries in the same room as signal processing equipment when the batteries are installed in a locked cabinet, which is not usually the case. This requirement aligns with NFPA 75 and 855.

Response Message: FR-4-NFPA 76-2022

Public Input No. 9-NFPA 76-2020 [Section No. 6.10.8.1.1.1]

First Revision No. 5-NFPA 76-2022 [Section No. 6.10.8.1.1.3]

~~6.10.8.1.1.3~~

~~Where telecommunications equipment is located in a structure or building housing multiple tenants or occupancies that include business, industrial, mercantile, or storage, battery systems shall be located in a room separated from other portions of the building by a minimum of a 1-hour fire barrier.~~

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Wed May 25 10:23:43 EDT 2022

Committee Statement

Committee Statement: The text is redundant to 6.10.8.1.1.2 and can be removed. The preceding section already specifies a minimum 1-hr fire barrier.
Response Message: FR-5-NFPA 76-2022

Public Input No. 31-NFPA 76-2021 [Section No. 6.10.8.1.1.3]

First Revision No. 6-NFPA 76-2022 [Section No. 6.10.8.2.1]

6.10.8.2.1 General.

Battery systems having an ~~electrolyte~~ energy storage capacity of more than ~~100 gal (378.5 L) in sprinklered buildings or 50 gal (189.3 L) in unsprinklered buildings~~ 70 kWh (252 MJ) for vented lead-acid, nickel-cadmium, and valve-regulated lead~~–~~ - acid (VRLA) batteries shall be in accordance with 6.10.8.2 and Table 6.10.8.2.1.

Table 6.10.8.2.1 Lead-Acid and Nickel-Cadmium Battery Requirements

-	Nonrecombinant Batteries		Recombinant Batteries
Requirement	Vented Lead-Acid	Vented Nickel-Cadmium (~~Ni-Cd~~ NiCad)	Valve-Regulated Lead~~–~~ - Acid (VRLA)
Safety caps	Venting caps	Venting caps	Self-resealing flame-arresting caps
Thermal runaway management	Not required	Not required	Required
Spill control	Required	Required	Not required
Neutralization	Required	Required	~~Required~~ Not required
Ventilation	Required	Required	Required
Signage	Required	Required	Required
Seismic control	Required	Required	Required
Fire detection	Required	Required	Required

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Wed May 25 10:26:56 EDT 2022

Committee Statement

Committee Statement: VRLA batteries don't require neutralization for the same reason they do not require spill control as they don't spill electrolyte. The threshold value was adjusted to align with NFPA 855 and the IFC. The reference to unpsrinklered and sprinklered buildings has been removed from the threshold requirements because there is now only a single threshold that determines the need for items listed in table 6.10.8.2.1 regardless of a building being unsprinklered and sprinklered.

Response Message: FR-6-NFPA 76-2022

Public Input No. 32-NFPA 76-2021 [Section No. 6.10.8.2.1]

First Revision No. 7-NFPA 76-2022 [Section No. 6.10.8.2.4]

6.10.8.2.4 Spill Control.

6.10.8.2.4.1

Rooms~~, buildings, or areas~~ containing free-flowing liquid electrolyte in ~~individual~~ multiple vessels having ~~a capacity of more than 55 gal (208 L) or multiple vessels having~~ an aggregate capacity exceeding 1000 gal (3785 L) shall be provided with spill control to prevent the flow of liquids to adjoining areas. [~~1: 52.2.2.4.1~~]

6.10.8.2.4.2*

~~An~~ The approved ~~method and materials for the control of a spill of electrolyte shall be provided that will be capable~~ spill control method shall be capable of controlling a spill from the single largest vessel. [~~1: 52.2.2.4.2~~]

6.10.8.2.4.3

VRLA batteries with immobilized electrolyte shall not require spill control. [~~1: 52.2.2.4.3~~]

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Wed May 25 10:46:22 EDT 2022

Committee Statement

Committee Statement: Simplification of spill control requirements. Spill control is needed when a room contains more than 1000 gallons of electrolyte - not a building. No single vessel of a lead-acid or nickel-cadmium ITE / UPS battery that has more than 55 gallons of electrolyte so that is removed.

Response Message: FR-7-NFPA 76-2022

Public Input No. 39-NFPA 76-2021 [Section No. 6.10.8.2.4]

Public Input No. 10-NFPA 76-2020 [Section No. 6.10.8.2.4.1]

First Revision No. 8-NFPA 76-2022 [Section No. 6.10.8.2.5.2]

6.10.8.2.5.2

For ~~VRLA~~ vented lead-acid and vented nickel-cadmium batteries, the method shall be capable of neutralizing a spill from the largest battery to a pH between 7.0 and 9.0. [~~**1:** 52.2.2.5.2~~]

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Wed May 25 11:16:16 EDT 2022

Committee Statement

Committee Statement: VRLA batteries do not require neutralization of spills as they do not spill. The correct reference is to Vented batteries - either VLA or Nickel-Cadmium.
Response Message: FR-8-NFPA 76-2022

Public Input No. 2-NFPA 76-2020 [Section No. 6.10.8.2.5.2]

First Revision No. 9-NFPA 76-2022 [Section No. 6.10.8.2.8.1]

6.10.8.2.8.1

An ~~approved automatic smoke detection~~ EWFD system shall be installed in rooms containing stationary battery storage systems in accordance with ~~*NFPA 72* .~~ [~~**1:** 52.2.2.10~~] Chapter 8 .

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Wed May 25 11:21:59 EDT 2022

Committee Statement

Committee Statement: This section has been revised to be consistent with 6.10.5.1 which requires EWFD for power areas which includes battery areas.
Response Message: FR-9-NFPA 76-2022

Public Input No. 11-NFPA 76-2020 [Section No. 6.10.8.2.8.1]

First Revision No. 10-NFPA 76-2022 [Sections 6.10.8.3, 6.10.8.4]

6.10.8.3 ~~Additional Battery Technologies.~~ Other Battery Types

Other battery types not addressed in 6.10.8.2 ~~or 6.10.8.3~~ shall be in accordance with Chapter 52 of NFPA 1.

~~**6.10.8.3.1** General.~~

~~Lithium-ion or sodium-nickel battery systems having a capacity of more than 20 KWh (18.0 Mega joules) shall be in accordance with 6.10.8.3 .~~

~~**6.10.8.3.1.1**~~

~~For batteries rated in amp-hours, KWh shall equal rated voltage times amp-hour rating divided by 1000.~~

~~**6.10.8.3.2** Maximum Allowable Quantities.~~

~~**6.10.8.3.2.1**~~

~~Fire areas within buildings containing stationary storage battery systems exceeding the maximum allowable quantity of 600 KWh (2160 mJ) shall comply with all applicable ordinary-hazard and high-hazard requirements as identified in 6.2.2 of NFPA *101* and the building code.~~

~~**6.10.8.3.2.2**~~

~~Where approved by the AHJ, areas containing stationary storage battery systems that exceed 600 KWh (2160 mJ) shall be permitted to be treated as an ordinary-hazard and not a high-hazard classification based on a hazardous mitigation analysis in accordance with 6.10.8.3.4 and large-scale fire and fault condition testing conducted or witnessed and reported by an approved testing laboratory.~~

~~**6.10.8.3.3** Battery Arrays.~~

~~**A.6.10.8.3.3**~~

~~A stationary battery array is an arrangement of individual stationary storage batteries in close proximity to each other, mounted on storage racks or in modules, battery cabinets, or other enclosures. [**1:** A.52.3.2.3]~~

~~**6.10.8.3.3.1**~~

~~Battery arrays shall comply with 6.10.8.3.3.2 and 6.10.8.3.3.3 unless otherwise permitted by 6.10.8.3.3.4 or 6.10.8.3.3.5 .[**1:** 52.3.2.3.1]~~

~~**6.10.8.3.3.2**~~

~~Storage batteries, prepackaged stationary storage battery systems, and pre-engineered stationary storage battery systems shall be segregated into arrays not exceeding 50 KWh (180 Mega joules) each. [**1:** 52.3.2.3.2]~~

~~**6.10.8.3.3.3**~~

~~Each array shall be spaced a minimum 3 ft (914 mm) from other arrays and from walls in the storage room or area. The storage arrangements shall comply with the egress provisions in NFPA *101* .[**1:** 52.3.2.3.3]~~

~~**6.10.8.3.3.4**~~

~~Listed pre-engineered stationary storage battery systems and prepackaged stationary storage battery systems shall not exceed 250 KWh (900 Mega joules) each. [**1:** 52.3.2.3.4]~~

6.10.8.3.3.5

The AHJ shall be permitted to approve listed pre-engineered and prepackaged battery arrays with larger capacities or smaller battery array spacing if large-scale fire and fault condition testing conducted or witnessed and reported by an approved testing laboratory is provided showing that a fire involving one array will not propagate to an adjacent array, and be contained within the room for a duration equal to the fire resistance rating of the room separation required by 6.10.8.1.1.3 . [**1:** 52.3.2.3.5]

6.10.8.3.4 Hazard Mitigation Analysis.

A failure mode and effects analysis (FMEA) or other approved hazard mitigation analysis shall be provided to the AHJ when any of the following conditions are present:

- Battery technologies not specifically identified in 6.10.8.3.1 are provided.
- More than one stationary storage battery technology is provided in a room or indoor area where there is a potential for adverse interaction between technologies.
- When allowed as a basis for increasing maximum allowable quantities as specified in 6.10.8.3.2 .

[**1:** 52.3.2.4]

6.10.8.3.4.1

The analysis shall evaluate the consequences of the following failure modes, and others deemed necessary by the AHJ. Only single failure modes shall be considered for each mode:

- Thermal runaway condition in a single module or array
- Failure of a battery management system
- Failure of a required ventilation system
- Voltage surges on the primary electric supply
- Short circuits on the load side of the stationary battery storage system
- Failure of the smoke detection, fire suppression, or gas detection system

[**1:** 52.3.2.4.1]

6.10.8.3.4.2

The AHJ shall be permitted to approve the hazardous mitigation analysis provided the consequences of the FMEA demonstrate the following:

- Fires or explosions will be contained within unoccupied stationary storage battery system rooms for the minimum duration of the fire resistance rated specified in 6.10.8.1.1.2 or 6.10.8.1.1.3 , as applicable
- Fires and explosions in stationary storage battery system cabinets in occupied work centers allow occupants to safely evacuate
- Toxic and highly toxic gases released during charging, discharging, and normal operation shall not exceed the permissible exposure limit (PEL)
- Toxic and highly toxic gases released during fires and other fault conditions shall not reach concentrations in access of IDLH level in the building or adjacent means of egress routes during the time deemed necessary to evacuate from that area
- Flammable gases released from batteries during charging, discharging, and normal operation shall not exceed 25 percent of the lower flammable limit (LFL)

[**1:** 52.3.2.4.2]

6.10.8.3.4.3

Construction, equipment, and systems that are required for the lithium-ion or sodium-nickel battery systems to comply with the hazardous mitigation analysis shall be installed, maintained, and tested in accordance with nationally recognized standards and specified design parameters.

6.10.8.3.5 Listings.

Storage batteries shall be listed in accordance with ANSI/UL 1973, *Standard for Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications* . Prepackaged and pre-engineered lithium-ion or sodium-nickel battery systems shall be listed in accordance with ANSI/UL 9540, *Outline of Investigation for Energy Storage Systems and Equipment* .

6.10.8.3.5.1 Prepackaged and Pre-engineered Systems.

Prepackaged and pre-engineered stationary storage battery systems shall be installed in accordance with their listing and the manufacturer's instructions. [**1:** 52.3.2.5.1]

A.6.10.8.3.5.1

A prepackaged stationary storage battery system is designed and investigated as a single unit, assembled in a factory, and shipped to the site. A pre-engineered stationary storage battery system is designed and investigated as a single unit, but is shipped in modular form for assembly at the site. [**1:** A.52.3.2.5.1]

6.10.8.3.6 Installation.

6.10.8.3.6.1 Battery Management System.

An approved battery management system shall be provided for monitoring and balancing cell voltages, currents, and temperatures within the manufacturer's specifications. The system shall transmit an alarm signal to an approved location if potentially hazardous temperatures or other conditions including short circuits, overvoltage (i.e., overcharge) or under voltage (i.e., over discharge) are detected. [**1:** 52.3.2.6.1]

6.10.8.3.6.2 Battery Chargers.

Battery chargers shall be compatible with the battery manufacturer's electrical ratings and charging specifications. Battery chargers shall be listed in accordance with the ANSI/UL 1564, *Standard for Industrial Battery Chargers* , or provided as part of a listed pre-engineered or prepackaged lithium-ion or sodium-nickel battery system.

6.10.8.3.6.3 Signage.

(A)

Approved signage shall be provided on doors or in approved locations near entrances to battery system rooms.

(B)

New signage installations shall require the following items:

Hazard identification markings in accordance with NFPA 704

"This room contains energized battery systems," or the equivalent

Identification of the type(s) of batteries present

AUTHORIZED PERSONNEL ONLY

Any potential hazards associated with the batteries

(C)

Where the battery storage system disconnecting means is not within sight of the main service disconnect, placards or directories shall be installed at the locations of the main service disconnect to indicate the location of all battery storage disconnecting means in accordance with *NFPA 70* . [**1:** 52.3.2.6.5.3]

(D)

Existing stationary storage battery systems shall be permitted to include the signage required at the time it was installed. [**1:** 52.3.2.6.5.4]

(E)

Fire command centers in buildings containing stationary storage battery systems shall include signage or readily available documentation that describes the location of stationary storage battery systems, the types of batteries present, operating voltages, and location of electrical disconnects. [**1:** 52.3.2.6.5.7]

6.10.8.3.6.4 Mixed Battery Systems.

Different types of batteries shall not be installed in the same room or cabinet if there is a potential for unsafe interaction between them, as determined by the AHJ. [**1:** 52.3.2.6.8]

A.6.10.8.3.6.4

This section is intended to address unique situations where the installation of different types of batteries in the same room or cabinet could create a situation where there is unacceptable chemical, thermal, or other interaction between them, or where the surrounding environment is not within the battery manufacturers' specifications. The AHJ has the option to require a hazard mitigation analysis, conducted in accordance with 6.10.8.3.4 , to identify hazards and potential solutions that will mitigate the hazards. [**1:** A.52.3.2.6.8]

6.10.8.3.7 Suppression and Detection.

6.10.8.3.7.1 Fire Suppression.

(A)

Rooms containing stationary storage battery systems shall be protected by an automatic sprinkler system installed in accordance with Section 13.3 of NFPA 1 or an approved alternative suppression system.

(B)

Commodity classifications for specific technologies of storage batteries shall be in accordance with Chapter 5 of NFPA 13 . [**1:** 52.3.2.7.1.1]

6.10.8.3.7.2 Smoke Detection.

An approved automatic smoke detection system shall be installed in rooms containing stationary storage battery systems in accordance with *NFPA 72* , and the required automatic smoke detection system shall be supervised by an approved central, proprietary, or remote station service or a local alarm that will give an audible signal at a constantly attended location.

6.10.8.3.8 Thermal Runaway.

Where required by 6.10.8.3.9 , a listed device or other approved method shall be provided to preclude, detect, and control thermal runaway. [**1:** 52.3.2.10]

6.10.8.3.9 Battery-Specific Protection.

Stationary storage battery systems shall comply with 6.10.8.2 through 6.10.8.3.8 and this section, as applicable. [**1:** 52.3.2.11]

6.10.8.3.9.1 Lithium-Ion Batteries.

Stationary storage battery systems utilizing lithium-ion batteries shall be provided with thermal runaway monitoring in accordance with 6.10.8.3.8 .

6.10.8.3.9.2 Sodium-Nickel Batteries.

Stationary storage battery systems utilizing sodium-nickel batteries shall be provided with thermal runaway monitoring in accordance with 6.10.8.3.8 .

6.10.8.3.10 Testing, Maintenance, and Repairs.

6.10.8.3.10.1

Stationary storage batteries and associated equipment and systems shall be tested and maintained in accordance with the manufacturer's instructions. [**1:** 52.3.2.12.1]

6.10.8.3.10.2

Any storage batteries or system components used to replace existing units shall be compatible with the battery charger, battery management systems, other storage batteries, and other safety systems. [**1:** 52.3.2.12.2]

~~**6.10.8.4** Other Battery Types.~~

~~Other battery types not addressed in 6.10.8.2 or 6.10.8.3 shall be in accordance with Chapter 52 of NFPA 1 .~~

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Wed May 25 11:40:02 EDT 2022

Committee Statement

Committee Statement: NFPA 855 covers the Energy Storage System requirements for the protection of lithium ion batteries and therefore the requirements have been deleted from NFPA 76. A task group has been put together to review the requirements in the 2023 edition of NFPA 855 Energy Storage Systems relating to lithium ion batteries to ensure they are meeting the needs of UPS per NFPA 76 as an occupancy standard.

Response Message: FR-10-NFPA 76-2022

Public Input No. 13-NFPA 76-2020 [Sections 6.10.8.3, 6.10.8.4]

Public Input No. 50-NFPA 76-2021 [Section No. 6.10.8.3.8]

Public Input No. 37-NFPA 76-2021 [Section No. 6.10.8.3.6.2]

Public Input No. 49-NFPA 76-2021 [Section No. 6.10.8.3.7.2]

Public Input No. 51-NFPA 76-2021 [New Section after 6.10.8.3.8]

Public Input No. 53-NFPA 76-2021 [New Section after 6.10.8.3.7.2]

Public Input No. 35-NFPA 76-2021 [Section No. 6.10.8.3.5]

Public Input No. 36-NFPA 76-2021 [Section No. 6.10.8.3.6.1]

Public Input No. 12-NFPA 76-2020 [Section No. 6.10.8.3.7.2]

Public Input No. 1-NFPA 76-2020 [Section No. 6.10.8.3.1.1]

First Revision No. 11-NFPA 76-2022 [Section No. 6.13.1.2]

6.13.1.2

Small work areas shall be permitted within the signal-processing equipment, power, and main distribution frame areas if the following conditions are met:

(1) Case furniture, including desks, is constructed of noncombustible material (e.g., metal). The construction can include a high-pressure laminate veneer on desktop.

(2) Any paper records, manuals, and drawings are stored in fully enclosed noncombustible cabinets or cases.

(3) Space dividers and system furniture panels and chairs with upholstered assemblies exhibit a maximum rate of heat release not exceeding 80 kW and a maximum total heat released not exceeding 25 MJ within the first 10 minutes of test when tested in accordance with ~~one of the following:~~ ASTM E1537.

~~ASTM E1537~~

~~California Technical Bulletin 133~~

(4) Noncombustible containers are provided for combustible material.

(5) The amount of records within the area ~~are~~ is kept to the absolute minimum required for essential and efficient operation.

(6) Only records that are essential to the operations are permitted to be kept in the area.

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Wed May 25 13:21:54 EDT 2022

Committee Statement

Committee Statement: The California Technical Bulletin 133 was repealed as of January 19, 2020. The remainder of the list covers the combustibility limitations and satisfies the intent of the paragraph.

Response Message: FR-11-NFPA 76-2022

Public Input No. 14-NFPA 76-2020 [Section No. 6.13.1.2]

First Revision No. 12-NFPA 76-2022 [Section No. 7.1.1]

7.1.1* Application.

This chapter applies to telecommunications facilities or a hazard area within, for which service continuity is provided by the following:

(1) Redundancy on site

(2) Redundancy off site

(3) Replacement

A.7.1.1

Some levels of system and equipment redundancy are typically provided to bolster the reliability of the telecommunications services. These can include redundant power feeds, rectifiers, battery strings, and network cable paths. At the signal processing equipment level, redundant power supplies, cooling fans, communications cards, and communications ports are common.

7.1.1.1 Redundancy On Site.

7.1.1.1.1

The telecommunications owner/operator shall be permitted to provide complete functionally redundant equipment in the same facility with manual or automatic transfer of service.

7.1.1.1.2

To ensure on-site service continuity when using the redundant on-site approach, the redundant equipment systems shall be physically separated using 1-hour fire-resistance-rated construction and a smoke management system shall be provided.

7.1.1.2 Redundancy Off Site.

The telecommunications owner/operator shall be permitted to provide complete functionally redundant equipment at a remote facility with manual or automatic transfer of service.

7.1.1.3 Replacement.

The telecommunications owner/operator shall be permitted to protect telecommunications service with replacement telecommunications equipment, facilities, or both where service can be quickly restored.

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Wed May 25 13:37:29 EDT 2022

Committee Statement

Committee Statement: Guidance in NFPA 76 to address normal levels of equipment and service redundancy has been added. As service delivery continues to become more concentrated, the size of "allowable" fires continues to shrink so that even a very small fire, limited to a single chassis can be very impactful to service. The new annex material provides guidance on recommended levels of redundancy to improve service reliability.

Response FR-12-NFPA 76-2022

Message:

Public Input No. 106-NFPA 76-2022 [Section No. 7.1.1]

First Revision No. 14-NFPA 76-2022 [Section No. 8.2.1]

8.2.1 Buildings.

Buildings housing telecommunications facilities shall be of Type I (442), Type I (332), Type II (222) or Type II (111) noncombustible or single-story construction of Type II (000) construction in accordance with NFPA 220.

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Wed May 25 13:54:00 EDT 2022

Committee Statement

Committee Statement: Building construction types have been added to section 8.2.1 to align with those in chapter 6.
Response Message: FR-14-NFPA 76-2022

Public Input No. 42-NFPA 76-2021 [Section No. 8.2.1]

First Revision No. 15-NFPA 76-2022 [Section No. 8.3.2.4.1]

8.3.2.4.1

Joints in or between walls and floor/ceiling assemblies of fire-resistance-rated construction shall be fire tested in accordance with ASTM E1966 or UL 2079 .

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Wed May 25 14:16:00 EDT 2022

Committee Statement

Committee Statement: UL 2079 The Standard for Tests for Fire Resistance of Building Joint Systems is an equivalent standard to ASTM E1966. This is consistent with similar references to both documents in NFPA 101.
Response Message: FR-15-NFPA 76-2022

Public Input No. 101-NFPA 76-2021 [Section No. 8.3.2.4.1]

First Revision No. 16-NFPA 76-2022 [Section No. 8.3.3.1.1]

8.3.3.1.1

Pipes, conduits, cables, and cable trays that penetrate fire-resistance-rated construction shall be protected with assemblies tested in accordance with ASTM E814 or UL 1479 .

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Wed May 25 14:24:46 EDT 2022

Committee Statement

Committee Statement: UL 1479, The Standard for Fire Tests of Penetration Firestops is an equivalent test standard to ASTM E814. This is consistent with similar references to both documents in NFPA 101.
Response Message: FR-16-NFPA 76-2022

Public Input No. 102-NFPA 76-2021 [Section No. 8.3.3.1.1]

First Revision No. 17-NFPA 76-2022 [Section No. 8.3.3.2.2]

8.3.3.2.2

The annular space around the HVAC system ductwork through fire-resistance-rated construction and smoke barriers shall be protected with a listed firestop system in accordance with ASTM E814 or UL 1479 .

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Wed May 25 14:28:11 EDT 2022

Committee Statement

Committee Statement: UL 1479, The Standard for Fire Tests of Penetration Firestops is an equivalent test standard to ASTM E814. This is consistent with similar references to both documents in NFPA 101.

Response Message: FR-17-NFPA 76-2022

Public Input No. 103-NFPA 76-2021 [Section No. 8.3.3.2.2]

First Revision No. 56-NFPA 76-2022 [New Section after 8.6.2.6]

8.6.2.7 Hybrid Fire-Extinguishing Systems.

8.6.2.7.1

Where provided hybrid fire-extinguishing systems shall be designed, installed, and maintained in accordance with NFPA 770.

8.6.2.7.2

Hybrid fire-extinguishing systems shall be designed and installed for the specific hazards, protection, and protection objectives as specified in the listing.

8.6.2.7.3

Detection systems used to actuate hybrid fire-extinguishing systems shall be designed in accordance with Section 8.5.

8.6.2.7.4

Detection systems utilized for the operation of hybrid fire-extinguishing systems shall be installed in accordance with the listing criteria.

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Wed Jun 08 07:30:15 EDT 2022

Committee Statement

Committee Statement: Added new language to allow for the use of hybrid fire-extinguishing systems. This aligns with the requirements for other fire suppression technologies throughout this section.
Response Message: FR-56-NFPA 76-2022

Public Input No. 110-NFPA 76-2022 [Section No. 8.6.2]

First Revision No. 19-NFPA 76-2022 [Section No. 8.8.2]

8.8.2 ~~Wire~~ Wires, ~~and~~ Cables, Raceways, Cable Routing Assemblies, and Cable Trays .

8.8.2.1

Telecommunications cables shall be listed ~~to~~ and marked in accordance with the requirements of ~~ANSI/~~ UL 444, *Communications Cables* .

8.8.2.1.1

Telecommunications cables shall be marked in accordance with Table 8.8.2.1.1.

Table 8.8.2.1.1 Telecommunications Cable Markings

Cable Type	Cable Marking
Plenum communications cable	Type CMP
Limited=smoke riser communications cable	Type CMR-ST1
Limited=smoke general-purpose communications cable	Type CMG-ST1, Type CM-ST1

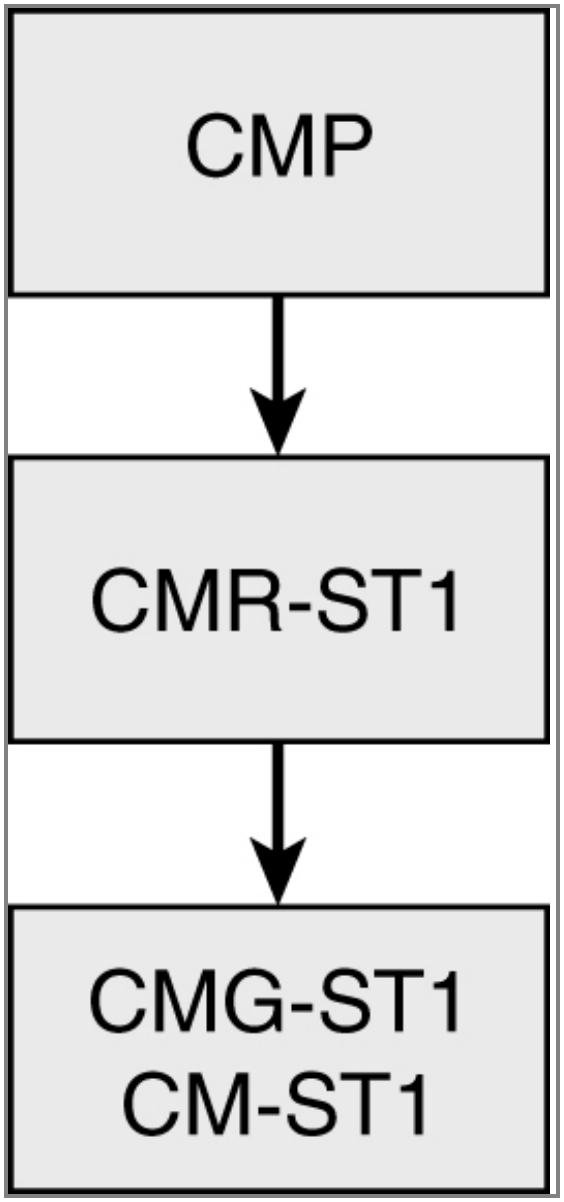
8.8.2.1.2

The substitutions for telecommunications cables that are shown in Table 8.8.2.1.2 and illustrated in Figure 8.8.2.1.2 shall be permitted.

Table 8.8.2.1.2 Telecommunications Cable Substitutions

Cable Type	Permitted Substitutions
CMR-ST1	CMP
CMG-ST1, CM-ST1	CMR-ST1

Figure 8.8.2.1.2 Cable Substitution Hierarchy.



8.8.2.2

Telecommunications wires shall be listed to the requirements for cross-connect wire in ~~ANSI/~~ UL 444.

8.8.2.3

Optical fiber cables shall be listed ~~to~~ and marked in accordance with the requirements of ~~ANSI/~~ UL 1651.

8.8.2.3.1

Optical fiber cables shall be marked in accordance with Table 8.8.2.3.1.

Table 8.8.2.3.1 Optical Fiber Cable Markings

Cable Type	Cable Marking
Nonconductive optical fiber plenum cable	Type OFNP
Conductive optical fiber plenum cable	Type OFCP
Limited-smoke nonconductive optical fiber riser cable	Type OFNR-ST1
Limited-smoke conductive optical fiber riser cable	Type OFCR-ST1
Limited-smoke nonconductive optical fiber general-purpose cable	Type OFNG-ST1, Type OFN-ST1
Limited-smoke conductive optical fiber general-purpose cable	Type OFCG-ST1, Type OFC-ST1

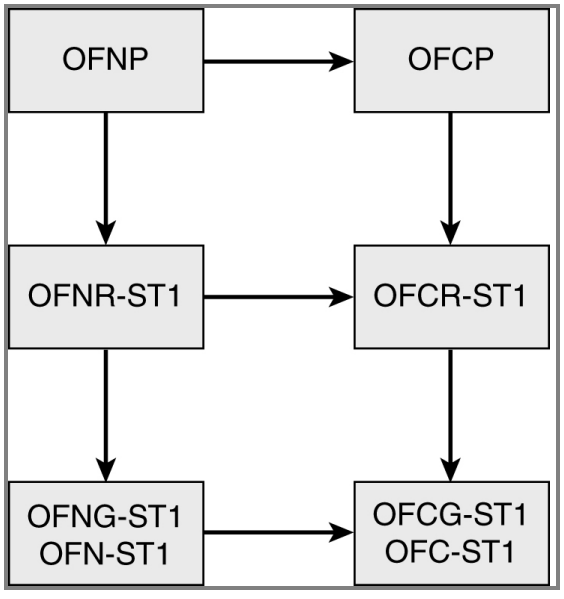
8.8.2.3.2

The substitutions for optical fiber cables shown in Table 8.8.2.3.2 and illustrated in Figure 8.8.2.3.2 shall be permitted.

Table 8.8.2.3.2 Communications Raceway Substitutions

Cable Type	Permitted Substitutions
OFCP	OFNP
OFNR-ST1	OFNP
OFCR-ST1	OFNP, OFCP, OFNR-ST1
OFNG-ST1, OFN-ST1	OFNP, OFNR-ST1
OFCG-ST1, OFC-ST1	OFNP, OFCP, OFNR-ST1, OFCR, ST1, OFNG-ST1, OFN-ST1

Figure 8.8.2.3.2



8.8.2.4

Wires and cables intended for powering signal-processing equipment and insulated ground wires shall be listed ~~to~~ and marked in accordance with the requirements of ~~ANSI/~~ UL 1277, ~~ANSI/~~ UL 44, or ~~ANSI/~~ UL 83 or shall be specifically listed for the purpose.

8.8.2.5

Communications raceways shall be listed ~~to~~ and marked in accordance with the requirements of ~~ANSI/~~ UL 2024.

8.8.2.5.1

Communications raceways cables shall be marked in accordance with Table 8.8.2.5.1.

Table 8.8.2.5.1 Communications Raceway Markings

Raceway Type	Raceway Marking
Plenum communications raceway	Plenum communications raceway
Riser communications raceway	Riser communications raceway
General-purpose communications raceway	General-purpose communications raceway

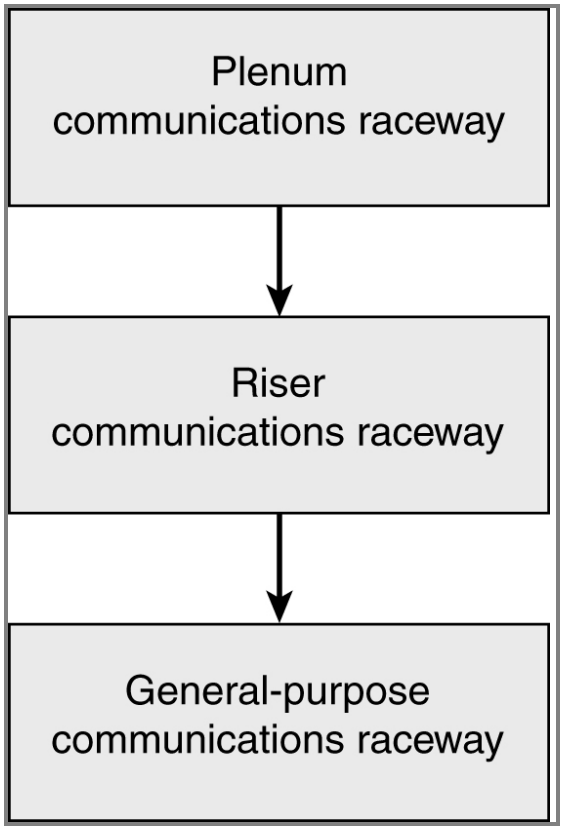
8.8.2.5.2

The substitutions for communications raceways shown in Table 8.8.2.5.2 and illustrated in Figure 8.8.2.5.2 shall be permitted.

Table 8.8.2.5.2 Communications Raceway Substitutions

Raceway Type	Permitted Substitutions
Riser communications raceway	Plenum communications raceway
General-purpose communications raceway	Riser communications raceway, general-purpose communications raceway

Figure 8.8.2.5.2



8.8.2.6

Cable routing assemblies shall be listed ~~to~~ and marked in accordance with the requirements of ~~ANSI/~~ UL 2024.

8.8.2.6.1

Cable routing assemblies shall be marked in accordance with Table 8.8.2.6.1.

Table 8.8.2.6.1 Cable Routing Assembly Markings

Cable Routing Assembly Type	Cable Routing Assembly Marking
Plenum cable routing assembly	Plenum cable routing assembly
Riser cable routing assembly	Riser cable routing assembly
General-purpose cable routing assembly	General-purpose cable routing assembly

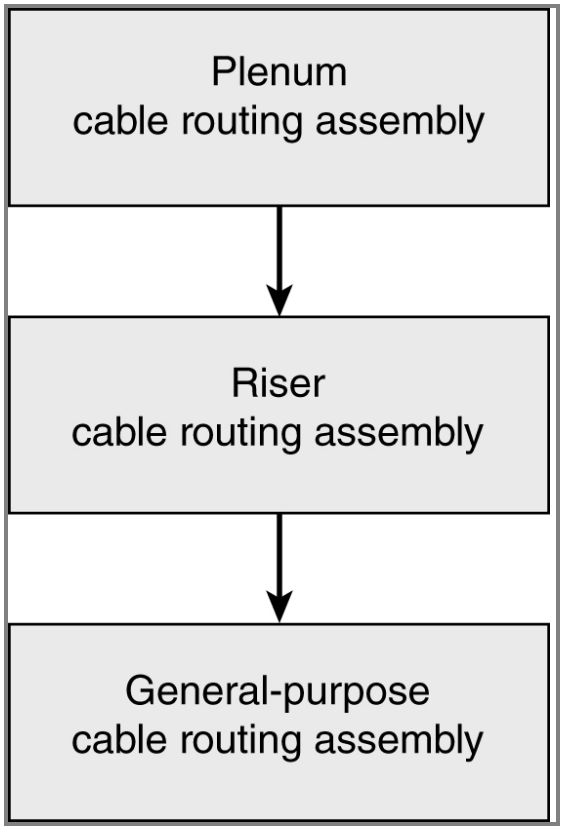
8.8.2.6.2

The substitutions for cable routing assemblies shown in Table 8.8.2.6.2 and illustrated in Figure 8.8.2.6.2 shall be permitted.

Table 8.8.2.6.2 Cable Routing Assembly Substitution Hierarchy.

Cable Routing Assembly Type	Permitted Substitutions
Riser cable routing assembly	Plenum cable routing assembly
General-purpose cable routing assembly	Riser cable routing assembly, general-purpose cable routing assembly

Figure 8.8.2.6.2



8.8.2.7

Nonmetallic cable trays shall be listed ~~to~~ in accordance with the requirements of ~~ANSI/~~ UL 568.

8.8.2.8 Raised Floor and Ceiling Cavity Plenums.

8.8.2.8.1

Wires and cables intended for powering signal-processing equipment, telecommunications cables (Type CMP plenum communications cables), Type OFNP optical fiber cables, Type OFCP conductive ~~,~~ optical fiber cables, and insulated ground wires installed in plenums shall be listed as having a maximum flame spread of 1.5 m (5.0 ft) or less, a maximum peak optical density of 0.50 or less, and a maximum average optical density of 0.15 or less when tested in accordance with NFPA 262.

8.8.2.8.2

Communications raceways installed in plenums shall be listed as ~~having a maximum flame spread of 1.5 m (5.0 ft) or less, a maximum peak optical density of 0.50 or less~~ plenum communications raceways ~~,~~ and ~~a maximum average optical density of 0.15 or less when tested~~ marked as plenum communications raceways in accordance with the requirements of ~~ANSI/~~ UL 2024, *Cable Routing Assemblies and Communications Raceways*.

8.8.2.8.3

Cable routing assemblies installed in plenums shall be listed ~~to~~ as plenum cable routing assemblies and marked plenum cable routing assemblies in accordance with the requirements of ~~ANSI/~~ UL 2024.

8.8.2.8.4*

Nonmetallic cable trays used in plenums shall be listed for use in plenums and ~~shall~~ be constructed of materials that are either noncombustible or ~~that~~ exhibit a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ~~with ANSI/~~ UL 723, ~~*Standard for*~~ *Test for Surface Burning Characteristics of Building Materials*.

8.8.2.9 Risers.

8.8.2.9.1

Telecommunications cables (Type CMR-ST1 limited-smoke riser communications cables), Type OFNR-ST1 limited-smoke nonconductive ~~,~~ optical fiber riser cables, Type OFCR-ST1 limited-smoke conductive optical fiber riser cables, wires and cables intended for powering signal-processing equipment, insulated ground wires, ~~communications raceways,~~ and nonmetallic cable trays installed vertically between floors in a building shall comply with ~~ANSI/~~ UL 1666. These cables shall demonstrate limited smoke generation by testing in accordance with ~~ANSI/~~ UL 1685.

8.8.2.9.2

Telecommunications cables~~,~~ (Type CMP plenum communications cables), Type OFNP nonconductive optical fiber cables, Type OFCP conductive optical fiber cables, wires and cables intended for powering signal-processing equipment, and insulated ground wires meeting the requirements of 8.8.2.8.1 shall be permitted.

8.8.2.9.3

~~Communications~~ Plenum communications raceways ~~meeting the requirements of 8.8.2.8.2~~ and riser communications raceways shall be permitted to be installed vertically between floors (risers) .

8.8.2.9.4

~~Cable~~ Plenum cable routing assemblies ~~meeting the requirements of 8.8.2.8.3 shall be permitted~~ and riser cable routing assemblies shall be permitted to be installed vertically between floors (risers) .

~~**8.8.2.9.5**~~

~~Cable routing assemblies shall be listed to the requirements of ANSI/UL 2024.~~

~~**8.8.2.9.6**~~

~~Cable routing assemblies meeting the requirements of 8.8.2.8.4 shall be permitted.~~

8.8.2.10 Installations Other Than Risers and Plenums.

Installations of telecommunications wires and cables, optical fiber cables, wires and cables intended for powering signal-processing equipment, and insulated ground wires in spaces other than risers or plenums shall comply with ~~8.8.2.10.1 or 8.8.2.10.2 or 8.8.2.10.3~~ 8.8.2.10.1 , 8.8.2.10.2 , or 8.8.2.10.3 .

8.8.2.10.1

Telecommunications wires ~~and~~ (listed communications wires), telecommunications cables~~,~~ (Type CM-ST1 limited-smoke general purpose communications cables), Type OFN-ST1 limited-smoke nonconductive optical fiber, general-purpose cables, Type OFC-ST1 limited-smoke conductive optical fiber general-purpose cables, wires and cables intended for powering signal-processing equipment, and insulated ground wires shall be listed as not spreading fire to the top of the tray and shall demonstrate limited smoke generation in the vertical-tray flame test in ~~ANSI/~~ UL 1685.

8.8.2.10.2

Telecommunications wires, ~~and~~ telecommunications cables (Type CMG-ST1 limited-smoke general-purpose communications cables), Type OFNG-ST1 limited-smoke nonconductive ~~,~~ optical fiber general-purpose cables, Type OFCG-ST1 limited-smoke conductive optical fiber general-purpose cables, wires and cables intended for powering signal-processing equipment, and insulated ground wires shall be listed as meeting the requirements of the FT-4 test in CSA Vertical Flame Test — Cables in Cable Trays in the *Test Methods for Electrical Wires and Cables*, C22.2 No. 0.3-~~M-1996~~ 09 (R2019) , with char length not to exceed 1.5 m (4 ft 11 in.). These cables shall demonstrate limited smoke generation by testing in accordance with ~~ANSI/~~ UL 1685.

8.8.2.10.3

Telecommunications cables, optical fiber cables, wires and cables intended for powering signal-processing equipment, and insulated ground wires meeting the requirements of ~~8.8.2.8.1 or 8.8.2.9.1~~ 8.8.2.8.1 or 8.8.2.9.1 shall be permitted.

8.8.2.10.3.1

Substitute cables selected in accordance with 8.8.2.1.2 and 8.8.2.3.2 shall be permitted.

8.8.2.10.4

~~Communications~~ Plenum, riser, and general-purpose communications raceways shall ~~not spread fire~~ be permitted to ~~the top of the tray~~ be installed in ~~the vertical-tray flame test in ANSI/UL 2024~~ spaces other than risers and plenums .

8.8.2.10.5

~~Cable~~ Plenum, riser, and general-purpose cable routing assemblies shall be ~~listed~~ permitted to ~~the requirements of ANSI/UL 2024~~ be installed in spaces other than risers and plenums .

8.8.2.10.6

~~Cable routing assemblies and communications raceways meeting the requirements of 8.8.2.8.2 or 8.8.2.9.1 shall be permitted.~~ Nonmetallic cable trays meeting the requirements of 8.8.2.8.4 or 8.8.2.9.1 shall be permitted.

~~**8.8.2.10.7**~~

~~Cable routing assemblies meeting the requirements of 8.8.2.8.4 or 8.8.2.9.5 shall be permitted.~~

Supplemental Information

File Name	Description	Approved
76_FDM_8.8.2.docx	For staff use only	

Submitter Information Verification

Committee: TEL-AAA

Submittal Date: Wed May 25 21:32:28 EDT 2022

Committee Statement

Committee Statement: This FR is editorial. Its intent is to illustrate and clarify requirements that are in the current edition of the standard; no technical changes are proposed. Since telecommunications cables, raceways, and cable routing assemblies need to be marked in order to ensure that they meet listing requirements, including marking requirements improves usability of the standard. Displaying substitution requirements in a table and an illustration improves the usability of the standard. ANSI has been removed from UL document titles.

Response Message: FR-19-NFPA 76-2022

Public Input No. 79-NFPA 76-2021 [New Section after 8.8.2.6]

Public Input No. 59-NFPA 76-2021 [Section No. 8.8.2.8.2]

Public Input No. 82-NFPA 76-2021 [Section No. 8.8.2.9.5]

Public Input No. 70-NFPA 76-2021 [Section No. 8.8.2.6]

Public Input No. 63-NFPA 76-2021 [Section No. 8.8.2.9.4]

Public Input No. 92-NFPA 76-2021 [Section No. 8.8.2.10.7]

Public Input No. 85-NFPA 76-2021 [Section No. 8.8.2.10.3]

Public Input No. 67-NFPA 76-2021 [Section No. 8.8.2.3]

Public Input No. 87-NFPA 76-2021 [Section No. 8.8.2.10.4]

Public Input No. 93-NFPA 76-2021 [Section No. 8.8.2.10.6]

Public Input No. 65-NFPA 76-2021 [Section No. 8.8.2.9.6]

Public Input No. 76-NFPA 76-2021 [New Section after 8.8.2.3]

Public Input No. 88-NFPA 76-2021 [Section No. 8.8.2.10.5]

Public Input No. 58-NFPA 76-2021 [Section No. 8.8.2.8.3]

Public Input No. 75-NFPA 76-2021 [New Section after 8.8.2.1]

Public Input No. 69-NFPA 76-2021 [Section No. 8.8.2.5]

Public Input No. 84-NFPA 76-2021 [Section No. 8.8.2.10.2]

Public Input No. 71-NFPA 76-2021 [Section No. 8.8.2.7]

Public Input No. 74-NFPA 76-2021 [Section No. 8.8.2.2]

Public Input No. 83-NFPA 76-2021 [Section No. 8.8.2.10.1]

Public Input No. 62-NFPA 76-2021 [Section No. 8.8.2.9.3]

Public Input No. 86-NFPA 76-2021 [New Section after 8.8.2.10.3]

Public Input No. 80-NFPA 76-2021 [Section No. 8.8.2.9.1]

Public Input No. 66-NFPA 76-2021 [Section No. 8.8.2.1]

Public Input No. 81-NFPA 76-2021 [Section No. 8.8.2.9.2]

Public Input No. 78-NFPA 76-2021 [New Section after 8.8.2.5]

Public Input No. 68-NFPA 76-2021 [Section No. 8.8.2.4]

Public Input No. 77-NFPA 76-2021 [Section No. 8.8.2]

Public Input No. 60-NFPA 76-2021 [Section No. 8.8.2.8.1]

First Revision No. 21-NFPA 76-2022 [Section No. 9.1.7.3]

9.1.7.3*

~~Propane stored in~~ The storage of propane cylinders and containers on the exterior of the telecommunications facility shall comply with ~~NFPA 54~~ , NFPA 58~~, and NFPA 51B~~ .

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Thu May 26 08:30:38 EDT 2022

Committee Statement

Committee Statement: NFPA 58 covers the outside storage of propane tanks and cylinders. NFPA 51B for hot work is already required by 9.1.6.2.
Response Message: FR-21-NFPA 76-2022

Public Input No. 17-NFPA 76-2020 [Section No. 9.1.7.3]

First Revision No. 22-NFPA 76-2022 [New Section after 10.3.1]

10.3.2* In-Building Emergency Responder Communications Enhancement Systems.

Where in-building emergency responder communications enhancement systems are required for the building, systems shall be installed to minimize interference with telecommunications equipment in accordance with NFPA 1225 .

A.10.3.2

Some telecommunications facilities are essential elements of the public safety network, providing communities with connectivity to 911 and E911, as well as processing of alarms and other signals. Telecommunications equipment may not have been designed or tested for immunity at the power levels and frequencies commonly used in responder radios. Telecommunications equipment rooms are not publicly accessible, and the number of incidents requiring responder access are low compared to many other occupancies. As these facilities are unique occupancies with such an important function, close cooperation between the facility operator and the emergency response organization(s) should be encouraged to assure responder activities are not unduly impaired and the telecommunications equipment remains functioning. Two-way radio communications enhancement systems deployed in common areas, stairwells, lobbies and other non-equipment room locations within telecommunications buildings are less of a concern.

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Thu May 26 08:47:31 EDT 2022

Committee Statement

Committee Statement: Language added on in-building emergency responder communications enhancement systems to ensure that their installation is coordinated to minimize disruption between first response radio communications and telecommunications equipment.

Response Message: FR-22-NFPA 76-2022

Public Input No. 29-NFPA 76-2021 [New Section after 10.3.1]

First Revision No. 23-NFPA 76-2022 [Section No. 10.4.2]

10.4.2

Selective depowering of the electrical systems shall be performed only after the investigation and evaluation indicates ~~either~~ one or ~~both~~ more of the following:

(1) Intervention will mitigate the event.

(2) Removal of a circuit pack or power to an overloaded circuit will terminate the event.

(3) Intervention will promote safety of responding personnel in a manner that expedites event resolution.

Submitter Information Verification

Committee: TEL-AAA

Submittal Date: Thu May 26 09:00:59 EDT 2022

Committee Statement

Committee Statement: Text was added to address the need to depower due to safety considerations. While powered telecom equipment is normally safe, there may be some instances in emergency conditions where this is not the case and this could be a factor in the need to depower.

Response Message: FR-23-NFPA 76-2022

Public Input No. 18-NFPA 76-2020 [Section No. 10.4.2]

First Revision No. 24-NFPA 76-2022 [New Section after 11.2.3]

11.2.4

Fire detection systems shall not be required in these facilities.

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Thu May 26 09:03:47 EDT 2022

Committee Statement

Committee Statement: Indirectly, section 11.2.1 exempts small facilities from fire detection installation requirements. However, as was done with Portable Fire Extinguishers in section 11.2.3, a more explicit exception is beneficial to telecom carriers.
Response Message: FR-24-NFPA 76-2022

Public Input No. 23-NFPA 76-2020 [New Section after 11.2.3]

First Revision No. 25-NFPA 76-2022 [Section No. A.3.3.2.4]

A.3.3.2.4 ~~Sodium-Nickel Battery~~ Valve-Regulated Lead Acid (VRLA) .

In VRLA batteries the liquid electrolyte in the cells is immobilized in an absorptive glass mat (AGM cells or batteries) or by the addition of a gelling agent (gel cells or gelled batteries).

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Thu May 26 09:17:31 EDT 2022

Committee Statement

Committee Statement: Current edition section heading is Sodium-Nickel Battery, but the section annexed is actually pertaining to VRLA batteries.
Response Message: FR-25-NFPA 76-2022

Public Input No. 4-NFPA 76-2020 [Section No. A.3.3.2.4]

First Revision No. 29-NFPA 76-2022 [Section No. A.3.3.2.5]

A.3.3.2.5 ~~Valve-Regulated Lead Acid (VRLA)~~ Vented (Flooded) .

Vented batteries have a provision for the user to add water to the cell and are equipped with a flame-arresting vent that permits the escape of hydrogen and oxygen gas from the cell in a manner such that a spark or other ignition source outside the cell will not ignite the gases inside the cell.

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Thu May 26 10:11:42 EDT 2022

Committee Statement

Committee Statement: The annex section references the wrong definition - it covers vented (flooded) batteries but it references VRLA batteries which are different from vented batteries.
Response Message: FR-29-NFPA 76-2022

Public Input No. 5-NFPA 76-2020 [Section No. A.3.3.2.5]

First Revision No. 30-NFPA 76-2022 [Section No. A.6.5]

A.6.5

The intent is to provide a procedure and any necessary marking of disconnect equipment to remove all sources of power from specific equipment or building areas that could be electrically overloaded or involved in a fire incident. The intent is not to provide an emergency power off capability as ~~required~~ referenced in Article 645 of *NFPA 70* and NFPA 75, because the use of telecommunications equipment and the consequences of disconnecting power are more severe than for the IT equipment covered by the requirements of *NFPA 70* and NFPA 75. The means to disconnect power should not be readily available to a casual occupant of the facility. It is permitted to require special knowledge of the power systems to operate the disconnecting means.

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Thu May 26 10:16:11 EDT 2022

Committee Statement

Committee Statement: Due to recent revisions, Article 645 of NFPA 70 does not require a EPO in all cases. A more appropriate term in place of "required" is "referenced."
Response Message: FR-30-NFPA 76-2022

Public Input No. 19-NFPA 76-2020 [Section No. A.6.5]

First Revision No. 31-NFPA 76-2022 [Section No. A.6.7.1]

A.6.7.1

The telecommunications facility normally has a battery system to operate the telecommunications equipment during power failure. This enables the public to use the communication network during power failures or planned outages for equipment servicing. In selected cases, where the telecommunications company acknowledges adequate power reserve, the battery system can be used as a source for emergency lighting systems as required by NFPA *101*. Where the telecommunications battery system is used as the sole source of emergency lighting system power (i.e., is not in parallel with unit equipment lighting power per *NFPA 70*), the telecommunications battery system should be maintained and meet the requirements of NFPA 111 for Level 1 power systems.

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Thu May 26 10:18:54 EDT 2022

Committee Statement

Committee Statement: Annex text has been added to clarify where using the telecom plant as the sole source of emergency power for egress lighting, the plant should be maintained as an NFPA 111 Level 1 power supply. This has additional requirements for maintenance, performance and documentation that may go beyond that provided by telecom routines. If unit power, via local batteries maintained and tested as part of the light device are provided in parallel, the telecom plant is a secondary backup to the in unit battery and does not need to meet NFPA 111 requirements. Recent work within NFPA 111 has been made to clarify this as well.

Response Message: FR-31-NFPA 76-2022

Public Input No. 3-NFPA 76-2020 [Section No. A.6.7.1]

First Revision No. 32-NFPA 76-2022 [Section No. A.6.10.8.2.4.2]

A.6.10.8.2.4.2

Methods of achieving this protection can include, but are not limited to, the following:

(1) Absorbent mats and materials

(2) Liquidtight sloped or recessed floors ~~in indoor locations or similar areas in outdoor locations~~

(3) Liquidtight floors in indoor locations ~~or similar areas in outdoor locations~~ provided with liquidtight raised or recessed sills or dikes

(4) Sumps and collection systems

(5) ~~Spill~~ Other spill containment systems such as ~~that~~ those described in A.6.10.8.2.5.1

~~[1: A.52.2.2.4.2]~~

The most likely times for severe battery damage and electrolyte spills are during the installation and replacement of vented cells. During these activities, spill control is recommended even for installations below the 1000 gallon per room threshold.

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Thu May 26 10:25:09 EDT 2022

Committee Statement

Committee Statement: The references to outdoor areas has been removed. Guidance has been added for the for absorbing spills during maintenance.
Response Message: FR-32-NFPA 76-2022

Public Input No. 38-NFPA 76-2021 [Section No. A.6.10.8.2.4.2]

First Revision No. 36-NFPA 76-2022 [Section No. A.6.10.8.2.6]

A.6.10.8.2.6

~~Information on~~ The fixed ventilation rate of 1 $ft^3/min/ft^2$ (5.1 $L/sec/m^2$) of floor area might be excessive compared to what is actually needed for room ventilation based on worst-case hydrogen production. Detailed information on battery room ventilation can be found in IEEE 1635/ASHRAE 21, *Guide ~~to Battery Room~~ for the Ventilation and Thermal Management of Batteries for Stationary Applications* .[~~1: A.52.2.2.6~~]

Where exhaust ventilation is used to control hydrogen levels, exhaust ventilation is often incorporated into the building heating, ventilation, and air-conditioning system. In such cases, the circulation of the battery room air into other spaces as part of the exhaust flow is allowable, provided the battery room exhaust rate conforms to section 6.10.8.2.6 .

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Thu May 26 10:53:24 EDT 2022

Committee Statement

Committee Statement: This adds guidance that the 1cfm/ft2 value is normally excessive and not preferred as it wastes energy and harms the planet.

It is very common in telecommunications applications to utilize a centralized HVAC system for air conditioning, air distribution and ventilation. Ventilation via the introduction of outdoor air and exhaust of return air is provided at the air handler, which may be remote from the battery room, as the battery room cooling load is often rather low compared to data processing areas. This can result in battery room air traveling through adjacent rooms to get back to a centralized air return grill prior to being exhausted from the building. This is permissible as the air mixture during ventilation is at all times non-explosive, non-flammable and non-toxic.

Response Message: FR-36-NFPA 76-2022

Public Input No. 40-NFPA 76-2021 [Section No. A.6.10.8.2.6]

Public Input No. 94-NFPA 76-2021 [Section No. A.6.10.8.2.6]

First Revision No. 37-NFPA 76-2022 [Section No. A.6.10.9.1]

A.6.10.9.1

For the installation of stationary fuel cell power systems, see NFPA 853. For solar photovoltaic (PV) systems, see Article 690 of *NFPA 70*. For fuel cell systems, see Article 692 of *NFPA 70*. For small wind electric systems, see Article 694 of *NFPA 70*. For Energy Storage Systems (ESS), see NFPA 855 .

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Thu May 26 11:04:54 EDT 2022

Committee Statement

Committee Statement: Adding a reference to NFPA 855 for ESS in a suitable location within NFPA 76.
Response Message: FR-37-NFPA 76-2022

Public Input No. 20-NFPA 76-2020 [Section No. A.6.10.9.1]

First Revision No. 33-NFPA 76-2022 [Section No. A.7.8.1]

A.7.8.1

The telecommunications facility normally has a battery system to operate the telecommunications equipment during power failure. This enables the public to use the communication network during power failures or planned outages for equipment servicing. In selected cases, where the telecommunications company acknowledges adequate power reserve, the battery system can be used as a source for emergency lighting systems as required by NFPA *101*. Where the telecommunications battery system is used as the sole source of emergency lighting system power (i.e., is not in parallel with unit equipment lighting power per *NFPA 70*), the telecommunications battery system should be maintained and meet the requirements of NFPA 111 for Level 1 power systems.

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Thu May 26 10:33:56 EDT 2022

Committee Statement

Committee Statement: Annex text has been added to clarify where using the telecom plant as the sole source of emergency power for egress lighting, the plant should be maintained as an NFPA 111 Level 1 power supply. This has additional requirements for maintenance, performance and documentation that may go beyond that provided by telecom routines. If unit power, via local batteries maintained and tested as part of the light device are provided in parallel, the telecom plant is a secondary backup to the in unit battery and does not need to meet NFPA 111 requirements. Recent work within NFPA 111 has been made to clarify this as well.

Response Message: FR-33-NFPA 76-2022

Public Input No. 15-NFPA 76-2020 [Section No. A.7.8.1]

First Revision No. 34-NFPA 76-2022 [Section No. A.8.7.2]

A.8.7.2

Smoke management for telecommunications facilities is different from smoke management applications for high-rise buildings or tall atria as prescribed in NFPA 92 and NFPA 204. Paragraph A.8.7.2 is intended to provide design guidance on the application of smoke management systems for telecommunications facilities given the unique applications. Note that in this application, smoke management systems are not intended for life safety and emergency egress of building occupants as they are in other industry applications. Given that, the requirements of those other standards intended to support life safety functions are not intended to apply to the application to telecommunications facilities. The reasons for smoke management systems in this application are as follows:

(1) To allow fire department personnel or operating personnel sufficient visibility to approach, locate, and depower equipment, and extinguish a fire without depowering the entire network facility

(2) To prevent damage to equipment and loss of emergency communication systems

(3) To provide means for rapid removal of smoke to permit continued cooling operations and prevent indirect damage to equipment from thermal effects and eventual loss of emergency communication systems

The smoke management system is intended to provide emergency removal of smoke contaminants from network equipment and power spaces in telecommunications buildings. Smoke removal is considered an important priority after a fire has been detected. Given the construction of the materials typically present in telecommunications spaces, damaging smoke and its subsequent removal require a higher priority than continued progression of a Class C fire, assuming the fire suppression (if present) is unable to extinguish the source. The fires associated with telecommunications switching equipment rooms are typically Class C, slow-burn fires (e.g., electrical fires or energy-augmented fires), involving little to no flame but with large amounts of smoke generation. It is desirable that the network equipment remain in operation throughout the duration of a fire. Because these facilities often provide emergency communications, in only the most extreme cases should the facility be completely depowered as result of a fire or disaster. Smoke management systems installed in signal-processing areas are intended to protect the electronic equipment from being exposed to the caustic and damaging contents of the smoke, thereby preventing circuit bridging, circuit pack failures, and large loss of equipment, and associated services, within these spaces. In addition, the smoke management system is intended to maintain the smoke layer above a minimum height necessary to allow depowering operations by operating personnel and local ~~fire-fighting~~ firefighting authorities. The smoke management system should also ~~should~~ serve as a smoke purge system to remove smoke after a fire by means of dilution ventilation.

Typical design objectives of the smoke management system are as follows:

(1) To remove smoke from the signal-processing areas

(2) To remove smoke from design fires associated with cabling, trays, equipment, and associated packaging materials that might be in the space being protected

(3) To provide the necessary makeup air

(4) To remove smoke quickly enough to maintain the smoke above equipment racks during the worst-case design fire scenario to protect the equipment from smoke damage and allow for depowering efforts

~~Three~~ The three distinct design approaches ~~are~~ commonly used for the smoke management systems used in telecommunications facilities~~,~~ are as follows:

(1) Smoke management — removal of smoke products during a fire event (during depowering efforts)

(2) Smoke removal — rapid removal of the smoke products after a fire event via dilution ventilation

(3) Smoke control — control of the spread of smoke to rooms that are not involved in the fire event; takes place from initial fire alarm through completion of the smoke removal of the affected zone until normal operations resume

The design approach for smoke management should be based on NFPA 92 using the following criteria:

(1) t^2 design fire~~.~~

(2) Very slow growth fire, >600 sec~~.~~

(3) Make-up air quantities ~~should~~ that are permitted to be ~~permitted~~ equivalent to the exhaust air quantities for a given space~~.~~

The design approach for smoke removal should be based on dilution ventilation sufficient to remove smoke within a time frame acceptable to the owner and within sufficient time to prevent thermal failure of signal-processing equipment after the fire has been extinguished. Dilution ventilation can be calculated using the logarithmic calculation found in *Principles of Smoke Management*. To take a fire alarm system out of alarm, the smoke concentration needs to be diluted below the sensitivity level of the smoke detectors. The design should be permitted to be based on the worst-case calculation from a smoke management or smoke purge design approach.

Calculations for design fire cases should be permitted to be derived from generally accepted engineering practice.

It is important for the system designer to be aware of the limitations for any equations used in the design. Some of them might be applicable only under a limited range of conditions that might or might not be present in the job being designed.

Typical assumptions used in a performance-based design can include the following:

(1) Good housekeeping practices are strictly followed, in which no amounts of combustible or flammable materials are stored in the critical equipment rooms.

(2) No combustible materials are located under raised floors.

(3) Telecommunications equipment or cabling involved in a fire will be depowered within 1 hour of an EWFD alarm.

(4) The smoke management system will operate after the fire suppression system (if present).

(5) Airflow is designed for smoke management during a fire event to maintain the smoke layer above equipment racks; airflow is also designed to be of sufficient rate to completely remove smoke within sufficient time to prevent thermal failure of the network equipment involved.

Smoke management systems should be provided in signal-processing equipment areas.

Refer to NFPA 92 and NFPA *101* for requirements of pressure control to ensure proper operation of doorways during system operation.

Smoke management systems should be permitted to be designed using applicable design calculations found in NFPA 92, NFPA 204, or *Principles of Smoke Management* using design fires in all spaces served by the smoke management system.

Equipment suitable for its intended use and the probable temperatures to which it is likely to be exposed should be permitted. Exhaust fans UL-listed for smoke management/control systems and carrying the UL-705 label or certified by the manufacturer to meet the minimum temperature and time requirements should be permitted. Smoke exhaust fans should be tested following ASHRAE 149.

Smoke dampers should be listed in accordance with UL 555S. Combination fire and smoke dampers should be listed in accordance with UL 555 and UL 555S. Dampers should be suitable for their intended use and the probable temperatures to which they are likely to be exposed. When present, dampers should have override capability for smoke management system operations. Damper override should not be permitted to close until temperatures exceed 177°C (350°F) in the duct. Dampers should be provided with limit switches used for verification of damper position in the control system and to ensure safe HVAC equipment operation.

Duct materials should be selected and designed to convey smoke, withstand additional pressure (both positive and negative) by the supply and exhaust fans when operating in a smoke-control mode, and maintain their structural integrity during the period for which the system is designed to operate. Ducts suitable for their intended use and the probable temperatures to which they are likely to be exposed should be permitted.

Control systems listed for smoke control applications in accordance with UL 864, ~~category UUKL~~ *Control Units and Accessories for Fire Alarm Systems* , for their intended purpose should be permitted.

A ~~fire fighters'~~ firefighters' smoke-control station (FSCS) per Annex H of NFPA 92 should be permitted. On/off/auto selectable switches (one per zone) should be permitted. An FSCS located behind locked cover for protection in public areas should be permitted. An FSCS located adjacent to a fire alarm panel or as directed by AHJ should be permitted.

A single control system or fire alarm system coordinating the smoke-control functions, FSCS, and any other related systems with the operation of the building HVAC systems and smoke-control equipment should be permitted.

A strobe light mounted at every entry point and labeled “EMERGENCY SMOKE MANAGEMENT SYSTEM IN OPERATION — DO NOT ENTER” at each zone served by the smoke management system should be permitted.

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Thu May 26 10:39:02 EDT 2022

Committee Statement

Committee Statement: Text added to denote that the concern is loss of service in addition to the loss of equipment. UL 864 title provided for smoke control applications. Category codes are used exclusively by UL were removed.

Response Message: FR-34-NFPA 76-2022

Public Input No. 21-NFPA 76-2020 [Section No. A.8.7.2]

First Revision No. 35-NFPA 76-2022 [Section No. A.9.8]

A.9.8

For new cabling installations, ac, dc, and telecommunications cables should be run in separate paths and not mixed. Where practical, unused or dead cables should be mined (removed) and discarded. Care should be taken during the removal process so as to protect the existing live cables from damage.

Infrared thermography or other like technology can be used to detect hot spots in telecommunications operations. Thermography scanning should be conducted for power boards, rectifiers, batteries, power room bus connectors, accessible power cable H-taps and C-taps, switchgear, ac/dc, and primary power supply.

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Thu May 26 10:49:06 EDT 2022

Committee Statement

Committee Statement: H-taps and C-taps can be a source of hot spots.
Response Message: FR-35-NFPA 76-2022

Public Input No. 22-NFPA 76-2020 [Section No. A.9.8]

First Revision No. 38-NFPA 76-2022 [Section No. B.2.2.3]

B.2.2.3 Power Supply and Leads.

A regulated dc power supply should be capable of supplying a current of 0 to 30 amperes at 0 to 18 volts dc ~~(i.e., Kenwood Model XL6524E-D)~~ . The lead wires between the power supply and the test wire(s) should be 10 AWG, 3.25 m (10.66 ft) long to avoid unacceptable voltage drop.

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Thu May 26 11:08:22 EDT 2022

Committee Statement

Committee Statement: The power supply referenced in the section is no longer available. A user of the standard should be able to find a suitable supply based on the specifications.
Response Message: FR-38-NFPA 76-2022

Public Input No. 46-NFPA 76-2021 [Section No. B.2.2.3]

First Revision No. 39-NFPA 76-2022 [Section No. C.1.3]

C.1.3 Main Distribution Frame (MDF) Area.

The wiring associated with distribution frames could be combustible due to the type of wire insulation used in the past and the large surface area created by the separation of wires. The wires forming the individual telecommunications circuits are usually protected against externally induced over-voltage conditions at the main distribution frame. Cables typically enter the frame area from a cable entrance facility area below through a floor or wall. Sealing of cable penetrations and ongoing maintenance of the seals are necessary ~~for~~ to maintain integrity of the fire separation of the MDF area ~~floor fire separation~~ from the cable entrance facility .

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Thu May 26 11:10:01 EDT 2022

Committee Statement

Committee Statement: Editorial rewording of the sentence for clarity.
Response Message: FR-39-NFPA 76-2022

Public Input No. 24-NFPA 76-2020 [Section No. C.1.3]

First Revision No. 40-NFPA 76-2022 [Section No. C.1.5 [Excluding any Sub-Sections]]

Alternating current (ac) power is converted to direct current (dc) power by rectifiers and is stored in batteries to power the telecommunications equipment. The batteries provide power during commercial ac power failures. The batteries can be expected to provide power to the signal-processing equipment for several hours. Visitors should act as if the batteries are fully charged at all times. This should be a consideration even when working in or around a “depowered” power area. Direct current bus bars are often not insulated, presenting a danger to personnel using metal tools or wearing metallic jewelry or watches in proximity to the bus bars.

Battery areas require proper ventilation to assure safety. Hydrogen gas ~~could be present and~~ can be produced during the use of both flooded cell and valve-regulated lead-acid (VRLA) batteries and should be vented to prevent the buildup to explosive levels.

Many types of batteries contain dilute sulfuric acid-based electrolyte.~~Hydrogen gas can be produced during battery use for both flooded cell and valve regulated lead acid (~~ VRLA~~)~~ batteries~~. Battery areas require proper ventilation. VRLA batteries~~ minimize acid spill potential, because the electrolyte is immobilized. The VRLA batteries do have the potential for mild thermal runaway events if overcharged or charged at elevated temperatures . VRLA batteries need to be maintained in a properly conditioned environment and should be monitored for signs of thermal runaway~~,~~ and increases in charging voltage, charging current, or battery temperature, so that proper action can be taken to prevent damage .

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Thu May 26 11:11:45 EDT 2022

Committee Statement

Committee Statement: This revision groups electrical, hydrogen, and spill hazards in a logical sequence. Added modifier "mild" to thermal runaway for VRLA batteries to distinguish from combustible fire events associated with thermal runaway of lithium-ion batteries which are also classified as thermal runaway but are actually chain-reaction venting of flaming gasses from lithium cells.

Response Message: FR-40-NFPA 76-2022

Public Input No. 25-NFPA 76-2020 [Section No. C.1.5 [Excluding any Sub-Sections]]

First Revision No. 41-NFPA 76-2022 [Section No. C.1.7]

C.1.7 Signal-Processing Equipment Areas.

Signal-processing equipment provides paths and switching for data, voice, video, broadband signals, packets, and streams. Circuit boards and wiring insulation are combustible, but much of the telecommunications equipment and cables in use in North America are designed and manufactured with fire-resistant components and treatments. Many of the requirements of this standard anticipate that the signal-processing equipment, wire, and cable in use has fire-~~resistance~~ resistant characteristics and ratings. The signal-processing equipment could contain both ac and dc power circuits from more than one source. The signal-processing equipment is very sensitive to products of combustion, including acid gases and soot, and can be sensitive to rapid changes in conditions, including ambient temperature and humidity.

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Thu May 26 11:15:00 EDT 2022

Committee Statement

Committee Statement: Term changed from "resistance" to "resistant" as this is the proper fire protection term for the annex material.
Response Message: FR-41-NFPA 76-2022

Public Input No. 26-NFPA 76-2020 [Section No. C.1.7]

First Revision No. 42-NFPA 76-2022 [Section No. C.1.10]

C.1.10 Multiple Power Sources.

Expect voltages of 120, 208, 240, 277, 480, and possibly 600 volts ac. The dc power most commonly used is 48 volts, 24 volts, and even lower for some circuits; however, newer dc systems with nominal voltages of 380 and 575 volts are being deployed.

Submitter Information Verification

Committee: TEL-AAA
Submittal Date: Thu May 26 11:18:54 EDT 2022

Committee Statement

Committee Statement: Common voltages were added.
Response Message: FR-42-NFPA 76-2022

Public Input No. 27-NFPA 76-2020 [Section No. C.1.10]

First Revision No. 47-NFPA 76-2022 [Chapter G]

Annex G Informational References

G.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.

G.1.1 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 1, *Fire Code*, ~~2018~~ 2021 edition.

NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems*, ~~2018~~ 2022 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, ~~2019~~ 2022 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, ~~2020~~ 2021 edition.

NFPA 30, *Flammable and Combustible Liquids Code*, ~~2018~~ 2021 edition.

NFPA 68, *Standard on Explosion Protection by Deflagration Venting*, 2018 edition.

NFPA 70®, *National Electrical Code*®, ~~2020~~ 2023 edition.

NFPA 72®, *National Fire Alarm and Signaling Code*®, ~~2019~~ 2022 edition.

NFPA 75, *Standard for the Fire Protection of Information Technology Equipment*, ~~2020~~ 2023 edition.

NFPA 80A, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures*, ~~2017~~ 2022 edition.

NFPA 92, *Standard for Smoke Control Systems*, ~~2018~~ 2021 edition.

NFPA *101*®, *Life Safety Code*®, ~~2018~~ 2021 edition.

NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems*, 2022 edition.

NFPA 204, *Standard for Smoke and Heat Venting*, ~~2018~~ 2021 edition.

NFPA 220, *Standard on Types of Building Construction*, ~~2018~~ 2021 edition.

NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations*, ~~2019~~ 2022 edition.

NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, ~~2018~~ 2023 edition.

NFPA 853, *Standard for the Installation of Stationary Fuel Cell Power Systems*, 2020 edition.

NFPA 855 , *Standard for the Installation of Stationary Energy Storage Systems* , 2023 edition.

NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*, ~~2018~~ 2022 edition.

NFPA 5000®, *Building Construction and Safety Code*®, ~~2018~~ 2021 edition.

Fire Protection Handbook, 20th edition.

FPRF, “Validation of Modeling Tools for Detection Design in High Air Flow Environments,” 2012.

FPRF, “Validation of Modeling Tools for Detection Design in High Air Flow Environments — Phase II,” 2014.

G.1.2 Other Publications.

G.1.2.1 ASHRAE Publications.

ASHRAE, ~~1791 Tullie Circle, NE, Atlanta, GA 30329-2305~~ 180 Technology Parkway, Peachtree Corners, GA 30092 .

ASHRAE 52.2, *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*, 2017.

ASHRAE 149, *Laboratory Methods of Testing Fans Used to Exhaust Smoke in Smoke Management Systems*, 2013.

Klote, J. H., and J. A. Milke, *Principles of Smoke Management*, 2002.

G.1.2.2 ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM E648, *Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source*, ~~2017a~~ 2019 .

G.1.2.3 BSI Publications.

BSI Group, 12950 Worldgate Drive, Suite 800, Herndon, VA 20170

BS 6266, *Fire Protection for Electronic Data Processing Installations*, ~~2011~~ 2016 .

G.1.2.4 CGA Publications.

Compressed Gas Association, ~~14501 George Carter Way, Suite 103, Chantilly, VA 20151~~ 8484 Westpark Drive, Suite 2210, McLean, VA 22102 .

CGA P-1, *Safe Handling of Compressed Gases in Containers*, ~~2015~~ 2021 .

G.1.2.5 FM Approvals Publications.

FM Approvals LLC, 1151 Boston-Providence Turnpike, P.O. Box 9102, Norwood, MA 02062.

FM Approvals Class Number 3972, *Test Standard for Cable Fire Propagation*, 2009.

G.1.2.6 FM Publications.

FM Global, 270 Central Avenue, P.O. Box 7500, Johnston, RI 02919.

Thumuluru, S., B. Ditch, P. Chatterjee, and M. Chaos, “Experimental Data for Model Validation of Smoke Transport in Data Centers,” 2014.

G.1.2.7 IEEE Publications.

IEEE, 3 Park Avenue, 17th Floor, New York, NY 10016-5997.

ANSI/IEEE 304, *Test Procedure for Evaluation and Classification of Insulation Systems for Direct-Current Machines*, 1977, reaffirmed 1991 (withdrawn 2004).

IEEE 1635/ASHRAE 21, *Guide for the Ventilation and Thermal Management of Batteries for Stationary Applications*, 2018.

G.1.2.8 SFPE Publications.

Society of Fire Protection Engineers, 9711 Washingtonian Blvd, Suite 380, Gaithersburg, MD 20878.

SFPE *Engineering Guide to Performance-Based Fire Protection*, 2nd edition.

SFPE *Guidelines for Peer Review in the Fire Protection Design Process*, 2009.

SFPE *Handbook of Fire Protection Engineering*, 5th edition.

G.1.2.9 UL Publications.

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

~~ANSI/~~ UL 555, ~~*Standard for*~~ *Fire Dampers*, ~~2006~~ 2020 .

~~ANSI/~~ UL 555S, ~~*Standard for*~~ *Smoke Dampers*, ~~2014~~ 2020 .

UL 568, *Nonmetallic Cable Tray Systems*, ~~2002~~ 2019 .

~~ANSI/~~ UL 864, ~~*Standard for*~~ *Control Units and Accessories for Fire Alarm Systems*, ~~2014~~ 2020 .

~~ANSI/~~ UL 60950-1, *Information Technology Equipment — Safety — Part 1: General Requirements*, ~~2013~~ 2020 .

UL ~~Subject~~ 2436, *Outline of Investigation for Spill Containment for Lead Acid Battery Systems*, ~~2006~~ 2020 .

G.1.2.10 U.S. Government Publications.

U.S. Government Publishing Office, 732 North Capitol Street, NW, Washington, DC 20401-0001.

Title 29, Code of Federal Regulations, Part 1910, “Telecommunications.”

Title 29, Code of Federal Regulations, Part 1910.34, “Coverage and Definitions.”

G.1.2.11 Other Publications.

Drysdale, D., *An Introduction to Fire Dynamics*, John Wiley & Sons, Chichester, England, 1998.

“Network Reliability: A Report to the Nation; Fire Prevention in Telecommunications Facilities,” Federal Communications Commission Network Reliability Council, 1993.

“Fire Extinguishment Testing of Sprinkler Protected Telecommunications Equipment,” Bell Northern Research, 1987.

Reagor, B. T., “Smoke Corrosivity: Generation, Impact, Detection and Protection Colloquium on Smoke Corrosivity,” *Journal of Fire Sciences,* Baltimore, MD, November 7–8, 1991.

“The Special Need for a Smoke Exhaust System to Minimize Secondary Damage to Electronic Telephone Switching Equipment,” H. H. Angus & Associates, 1992.

Tanaka, T. J., “Effects of Smoke on Functional Circuits,” NUREG/CR-6542 SAND97-2544.

Tanaka T. J., S. P. Nowlen, and D. J. Anderson, “Circuit Bridging of Components by Smoke,” NUREG/CR-6476 SAND96-2633.

Telcordia GR-63-CORE, (formerly Bellcore), *Network Equipment Building System (NEBS)™ Requirements: Physical Protection*, Issue 2, April 2002.

G.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.

G.2.1 ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM D2863, *Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-like Combustion of Plastics (Oxygen Index)*, ~~2017a~~ 2019 .

ASTM E380, *Standard Practice for Use of the International System of Units (SI) (The Modernized Metric System)*, 1993.

ASTM E1354, *Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter*, ~~2013m (withdrawn 2017).~~ 2022.

G.2.2 ATIS Publications.

Alliance for Telecommunications Industry Solutions, 1200 G Street NW, Suite 500, Washington, DC 20005.

ATIS 0600311, *DC Power Systems — Telecommunications Environment Protection*, ~~2007 (R2012).~~ 2017.

ATIS 0600328, *Protection of Telecommunications Links from Physical Stress and Radiation Effects and Associated Requirements for DC Power Systems*, ~~2012~~ 2018 .

G.2.3 CSA Group Publications.

CSA Group, 178 Rexdale Boulevard, Toronto, ON M9W 1R3, Canada.

CSA C22.2, No. 0.3, *Test Methods for Electrical Wires and Cables*, ~~2009, revised 2014~~ 2020 .

G.2.4 DOE Publications.

U.S. Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585.

DOE/EP-0108, *Standard for Fire Protection of DOE Electronic Computer/Data Processing Systems, Annex B, Reconditioning of Flooded and Smoke-Contaminated Equipment*, 1986.

G.2.5 IEEE Publications.

IEEE, 3 Park Avenue, 17th Floor, New York, NY 10016-5997.

ANSI/IEEE 383, *Standard for Qualifying Class IE Electric Cables and Field Splices for Nuclear Power Generating Stations*, 2015.

ANSI/IEEE 1202, *Standard for Flame-Propagation Testing of Wire and Cable*, 2006/Cor 1-2012.

G.2.6 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 262, *Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces*, ~~2019~~ 2023 .

G.2.7 UL Publications.

UL LLC, 333 Pfingsten Road, Northbrook, IL 60062-2096.

~~ANSI/~~ UL 263, ~~*Standard for*~~ *Fire Tests of Building Construction and Materials*, ~~2011~~ 2022 .

UL 510, ~~*Standard for*~~ *Safety Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape*, ~~2017~~ 2020 .

~~ANSI/~~ UL 1441, *Coated Electrical Sleeving*, ~~2005~~ 2021 .

~~ANSI/~~ UL 1479, ~~*Standard for*~~ *Fire Tests of Through-Penetration Firestops*, 2015.

~~ANSI/~~ UL 1581, *Reference Standard for Electrical Wires, Cables, and Flexible Cords,* 2001.

~~ANSI/~~ UL 1666, ~~*Standard for*~~ *Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts*, 2007.

~~ANSI/~~ UL 1685, ~~*Standard for*~~ *Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables*, ~~2007~~ 2020 .

~~ANSI/~~ UL 1784, *Air Leakage Tests of Door Assemblies*, ~~2015~~ 2020 .

G.2.8 Other Publications.

ASHRAE Handbook — Fundamentals, 2013.

IEC 60695-4, *Fire Hazard Testing — Part 4: Terminology concerning fire tests for electromechanical products*, 2012.

IEC 60695-11-5, *Fire Hazard Testing — Part 11-5: Test flames - Needle-flame test method - Apparatus, confirmatory test arrangement and guidance*, 2014.

ISO 9705, *Fire Test — Full Scale Room Test for Surface Products*, 1993.

Klote, J.H., J.A. Milke, P.G. Turnbull, A. Kashef, and M.J. Ferreira, *Handbook of Smoke Control Engineering*, 2012.

National Bureau of Standards Handbook 91, *Experimental Statistics*, Mary Gibbons Natrella, August 1963.

T1E1.8/95-032, *Telecommunications Central Office Equipment Fire Research Report*, May 1992.

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

Supplemental Information

File Name	Description	Approved
76-2020_Annex_G.docx	For Staff Use Only	

Submitter Information Verification

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Submittal Date: Fri May 27 08:25:19 EDT 2022

Committee Statement

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Public Input No. 91-NFPA 76-2021 [Section No. G.1.2.9]

Public Input No. 105-NFPA 76-2021 [Section No. G.1.2.9]