

NFPA[®]

75

Standard for the
Fire Protection of
Information Technology Equipment

2020



IMPORTANT NOTICES AND DISCLAIMERS CONCERNING NFPA® STANDARDS

NFPA® codes, standards, recommended practices, and guides (“NFPA Standards”), of which the document contained herein is one, are developed through a consensus standards development process approved by the American National Standards Institute. This process brings together volunteers representing varied viewpoints and interests to achieve consensus on fire and other safety issues. While the NFPA administers the process and establishes rules to promote fairness in the development of consensus, it does not independently test, evaluate, or verify the accuracy of any information or the soundness of any judgments contained in NFPA Standards.

The NFPA disclaims liability for any personal injury, property, or other damages of any nature whatsoever, whether special, indirect, consequential or compensatory, directly or indirectly resulting from the publication, use of, or reliance on NFPA Standards. The NFPA also makes no guaranty or warranty as to the accuracy or completeness of any information published herein.

In issuing and making NFPA Standards available, the NFPA is not undertaking to render professional or other services for or on behalf of any person or entity. Nor is the NFPA undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances.

The NFPA has no power, nor does it undertake, to police or enforce compliance with the contents of NFPA Standards. Nor does the NFPA list, certify, test, or inspect products, designs, or installations for compliance with this document. Any certification or other statement of compliance with the requirements of this document shall not be attributable to the NFPA and is solely the responsibility of the certifier or maker of the statement.

REVISION SYMBOLS IDENTIFYING CHANGES FROM THE PREVIOUS EDITION

Text revisions are shaded. A **Δ** before a section number indicates that words within that section were deleted and a **Δ** to the left of a table or figure number indicates a revision to an existing table or figure. When a chapter was heavily revised, the entire chapter is marked throughout with the **Δ** symbol. Where one or more sections were deleted, a **•** is placed between the remaining sections. Chapters, annexes, sections, figures, and tables that are new are indicated with an **N**.

Note that these indicators are a guide. Rearrangement of sections may not be captured in the markup, but users can view complete revision details in the First and Second Draft Reports located in the archived revision information section of each code at www.nfpa.org/docinfo. Any subsequent changes from the NFPA Technical Meeting, Tentative Interim Amendments, and Errata are also located there.

REMINDER: UPDATING OF NFPA STANDARDS

Users of NFPA codes, standards, recommended practices, and guides (“NFPA Standards”) should be aware that these documents may be superseded at any time by the issuance of a new edition, may be amended with the issuance of Tentative Interim Amendments (TIAs), or be corrected by Errata. It is intended that through regular revisions and amendments, participants in the NFPA standards development process consider the then-current and available information on incidents, materials, technologies, innovations, and methods as these develop over time and that NFPA Standards reflect this consideration. Therefore, any previous edition of this document no longer represents the current NFPA Standard on the subject matter addressed. NFPA encourages the use of the most current edition of any NFPA Standard [as it may be amended by TIA(s) or Errata] to take advantage of current experience and understanding. An official NFPA Standard at any point in time consists of the current edition of the document, including any issued TIAs and Errata then in effect.

To determine whether an NFPA Standard has been amended through the issuance of TIAs or corrected by Errata, visit the “Codes & Standards” section at www.nfpa.org.

ADDITIONAL IMPORTANT NOTICES AND DISCLAIMERS CONCERNING NFPA® STANDARDS

Updating of NFPA Standards

Users of NFPA codes, standards, recommended practices, and guides (“NFPA Standards”) should be aware that these documents may be superseded at any time by the issuance of a new edition, may be amended with the issuance of Tentative Interim Amendments (TIAs), or be corrected by Errata. It is intended that through regular revisions and amendments, participants in the NFPA standards development process consider the then-current and available information on incidents, materials, technologies, innovations, and methods as these develop over time and that NFPA Standards reflect this consideration. Therefore, any previous edition of this document no longer represents the current NFPA Standard on the subject matter addressed. NFPA encourages the use of the most current edition of any NFPA Standard [as it may be amended by TIA(s) or Errata] to take advantage of current experience and understanding. An official NFPA Standard at any point in time consists of the current edition of the document, including any issued TIAs and Errata then in effect.

To determine whether an NFPA Standard has been amended through the issuance of TIAs or corrected by Errata, visit the “Codes & Standards” section at www.nfpa.org.

Interpretations of NFPA Standards

A statement, written or oral, that is not processed in accordance with Section 6 of the Regulations Governing the Development of NFPA Standards shall not be considered the official position of NFPA or any of its Committees and shall not be considered to be, nor be relied upon as, a Formal Interpretation.

Patents

The NFPA does not take any position with respect to the validity of any patent rights referenced in, related to, or asserted in connection with an NFPA Standard. The users of NFPA Standards bear the sole responsibility for determining the validity of any such patent rights, as well as the risk of infringement of such rights, and the NFPA disclaims liability for the infringement of any patent resulting from the use of or reliance on NFPA Standards.

NFPA adheres to the policy of the American National Standards Institute (ANSI) regarding the inclusion of patents in American National Standards (“the ANSI Patent Policy”), and hereby gives the following notice pursuant to that policy:

NOTICE: The user’s attention is called to the possibility that compliance with an NFPA Standard may require use of an invention covered by patent rights. NFPA takes no position as to the validity of any such patent rights or as to whether such patent rights constitute or include essential patent claims under the ANSI Patent Policy. If, in connection with the ANSI Patent Policy, a patent holder has filed a statement of willingness to grant licenses under these rights on reasonable and nondiscriminatory terms and conditions to applicants desiring to obtain such a license, copies of such filed statements can be obtained, on request, from NFPA. For further information, contact the NFPA at the address listed below.

Law and Regulations

Users of NFPA Standards should consult applicable federal, state, and local laws and regulations. NFPA does not, by the publication of its codes, standards, recommended practices, and guides, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.

Copyrights

NFPA Standards are copyrighted. They are made available for a wide variety of both public and private uses. These include both use, by reference, in laws and regulations, and use in private self-regulation, standardization, and the promotion of safe practices and methods. By making these documents available for use and adoption by public authorities and private users, the NFPA does not waive any rights in copyright to these documents.

Use of NFPA Standards for regulatory purposes should be accomplished through adoption by reference. The term “adoption by reference” means the citing of title, edition, and publishing information only. Any deletions, additions, and changes desired by the adopting authority should be noted separately in the adopting instrument. In order to assist NFPA in following the uses made of its documents, adopting authorities are requested to notify the NFPA (Attention: Secretary, Standards Council) in writing of such use. For technical assistance and questions concerning adoption of NFPA Standards, contact NFPA at the address below.

For Further Information

All questions or other communications relating to NFPA Standards and all requests for information on NFPA procedures governing its codes and standards development process, including information on the procedures for requesting Formal Interpretations, for proposing Tentative Interim Amendments, and for proposing revisions to NFPA standards during regular revision cycles, should be sent to NFPA headquarters, addressed to the attention of the Secretary, Standards Council, NFPA, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101; email: stds_admin@nfpa.org.

For more information about NFPA, visit the NFPA website at www.nfpa.org. All NFPA codes and standards can be viewed at no cost at www.nfpa.org/docinfo.

Copyright © 2019 National Fire Protection Association®. All Rights Reserved.

NFPA® 75

Standard for the

Fire Protection of Information Technology Equipment

2020 Edition

This edition of NFPA 75, *Standard for the Fire Protection of Information Technology Equipment*, was prepared by the Technical Committee on Electronic Computer Systems. It was issued by the Standards Council on November 4, 2019, with an effective date of November 24, 2019, and supersedes all previous editions.

This edition of NFPA 75 was approved as an American National Standard on November 24, 2019.

Origin and Development of NFPA 75

The Committee on Electronic Computer Systems was formed by the action of the NFPA Board of Directors in January 1960, following a request for standardization of fire protection recommendations by the computer industry.

The committee first submitted the *Standard for the Protection of Electronic Computer Systems* to the 1961 NFPA Annual Meeting, and it was tentatively adopted. At the 1962 Annual Meeting, it was officially adopted as an NFPA standard. Revisions were adopted in 1963, 1964, 1968, 1972, 1976, 1981, 1987, and 1989. The document was completely rewritten for the 1992 edition. The document was revised in 1995, 1999, and again in 2003. The 2003 edition incorporated the *Manual of Style for NFPA Technical Committee Documents* revisions.

In editions of this standard prior to 2003, the terms *electronic computer/data processing equipment* and *electronic computer system* were used where the current terms *information technology equipment* and *information technology equipment system*, respectively, are used. Similarly, the terms *computer room* and *computer area* were replaced by *information technology equipment room* and *information technology equipment area*, respectively. The title was changed from *Standard for the Protection of Electronic Computer/Data Processing Equipment* to *Standard for the Protection of Information Technology Equipment*. While the title and some terminology were changed in the 2003 edition to more closely align this standard's terminology with terminology being used in other standards, such as NFPA 70, *National Electrical Code*, and UL 60950, *Safety of Information Technology Equipment*, the scope of this standard and any definitions associated with those like terms remained the same.

For the 2009 edition, Section 4.2, Telecommunications Risks, was updated; many of the UL references were updated; new requirements were added for signage to indicate that equipment will remain energized where continuous power is provided; and flame spread indexes were provided for many of the materials listed in the standard.

For the 2013 edition, the title was again changed, to *Standard for the Fire Protection of Information Technology Equipment*, to better reflect the scope of the document and to be clear that the standard is strictly for fire protection. The 2013 edition featured a new section on the emerging use of aisle containment systems for information technology equipment and how such systems must be assessed for their interaction with fire protection features. A number of definitions were extracted from NFPA 70 to define words used in the body of the standard that previously were not defined.

The 2017 edition of the standard was revised to permit performance-based designs for specific provisions of the standard. Chapter 4 was revised to state the approaches that are permitted to be followed (prescriptive or performance-based), and a new Chapter 5 was added that details the requirements when a performance-based approach is selected. This was done to account for changes in the operation of data centers that can require more flexibility than is often provided by prescriptive approaches.

Extensive annex material that provides guidance on designing detection for high airflow environments, including detector sensitivity and spacing, was added to the standard based on Fire Protection Research Foundation reports.

For the 2020 edition of the standard, air sampling detector port location and coverage was clarified. The requirement for inside hose stream was deleted as the fire department utilizes their own hose and will most likely not use the inside hose located in the structure. New Chapter 13, Modular Data Centers, was added to specify which requirements from other chapters apply to modular data centers. The requirements for 1- and 2-hour fire barriers were clarified for structures that contain multiple occupancies. Battery requirements were extracted from Chapter 52 of NFPA 1, *Fire Code*.

Technical Committee on Electronic Computer Systems

Lee A. Kaiser, *Chair*
Orr Protection Systems, Inc., KY [IM]

Scott R. Lang, *Secretary*
Honeywell International, IL [M]
Rep. Automatic Fire Alarm Association, Inc.

Mark J. Aaby, Koffel Associates, Inc., MD [SE]

Alastair R. Brown, HKA Global, Scotland [SE]

Thomas M. Burke, UL LLC, CA [RT]
Rep. UL LLC

Sheila C. DeMand, Aon, MO [I]

Jeffrey T. Dudley, National Aeronautics & Space Administration,
Kennedy Space Center (NASA), FL [U]

Jim Faber, Van Wagner Sports & Entertainment, TX [SE]

Vince Hawxhurst, Schneider Electric, MA [U]

Robert Kasiski, FM Global, MA [I]

Stanley Kaufman, CableSafe, Inc./OFS, GA [M]
Rep. Plastics Industry Association (Plastics)

Richard G. Kluge, Ericsson, NJ [U]
Rep. Alliance for Telecommunications Industry Solutions

James R. Lugar, JENSEN HUGHES, MD [SE]
Rep. JENSEN HUGHES

Chad Mariska, APS FireCo, OK [IM]
Rep. National Association of Fire Equipment Distributors

Rita L. Neiderheiser, UA Sprinkler Fitters LU 669, CO [L]

Michael Paras, Environmental Systems Design, Inc., IL [SE]

Keith J. Polasko, US National Security Agency, MD [E]

Jack Poole, Poole Fire Protection, Inc., KS [SE]

Bryan K. Powell, AXA XL/XL Risk Consulting/Global Asset
Protection Services, LLC, VA [I]

Rodger Reiswig, Johnson Controls, FL [M]

Mark L. Robin, Chemours, DE [M]
Rep. Fire Suppression Systems Association

Jason D. Rotondo, CODEpliance Inc., MA [U]

Joseph A. Spataro, American International Group, Inc., NY [I]

Derek P. Wester, Amerex Corporation, AL [M]
Rep. Fire Equipment Manufacturers' Association

Randy Willard, US Central Intelligence Agency, MD [U]

Kevin Wiseman, Allianz, TX [I]

Thomas J. Wysocki, Guardian Services, Inc., IL [SE]

Alternates

Wayne J. Aho, Jr., Johnson Controls, MA [M]
(Alt. to Rodger Reiswig)

Robert J. Ballard, Victaulic, PA [M]
(Alt. to Mark L. Robin)

Connie Bottemiller, Aon Global Risk, WA [I]
(Alt. to Sheila C. DeMand)

James S. Crews, Allianz, GA [I]
(Alt. to Kevin Wiseman)

Richard Ffrench, FM Global, RI [I]
(Alt. to Robert Kasiski)

Louis Guerrazzi, National Fire Sprinkler Association, MD [M]
(Voting Alt.)

Steven M. Guthrie, Global Asset Protection Services, LLC, PA [I]
(Alt. to Bryan K. Powell)

William D. Johnson, Mid State Fire Equipment Inc., FL [IM]
(Alt. to Chad Mariska)

Scott Kincaid, Brooks Equipment Company, NC [M]
(Alt. to Derek P. Wester)

William E. Koffel, Koffel Associates, Inc., MD [SE]
(Alt. to Mark J. Aaby)

Daniel Dean Lloyd, Munich Re/Hartford Steam Boiler, TX [I]
(Voting Alt.)

Max McLeod, Siemens Industry, Inc., AL [M]
(Alt. to Scott R. Lang)

Andrew W. Poole, Poole Fire Protection, Inc., KS [SE]
(Alt. to Jack Poole)

Randy H. Schubert, Ericsson, NJ [U]
(Alt. to Richard G. Kluge)

Blake M. Shugarman, UL LLC, IL [RT]
(Alt. to Thomas M. Burke)

Mark Suski, JENSEN HUGHES, IL [SE]
(Alt. to James R. Lugar)

Stacie K. Tunnessen, US Central Intelligence Agency, VA [U]
(Alt. to Randy Willard)

Anthony Villamor, Oracle America, Inc., CA [M]
(Voting Alt.)

Nonvoting

Edward D. Leedy, Naperville, IL [SE]
(Member Emeritus)

Donald E. Reilly, Staten Island, NY [I]
(Member Emeritus)

Richard P. Bielen, NFPA Staff Liaison

This list represents the membership at the time the Committee was balloted on the final text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the back of the document.

NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

Committee Scope: This Committee shall have primary responsibility for documents on the protection of electronic computer equipment, components, and associated records.

Contents

Chapter 1 Administration	75- 5	9.5 Warning Signs.	75- 14
1.1 Scope.	75- 5	9.6 Training.	75- 14
1.2 Purpose.	75- 5	9.7 Expansion or Renovations.	75- 14
1.3 Application.	75- 5	9.8 Water Mist Fire Protection Systems.	75- 14
1.4 Retroactivity.	75- 5		
1.5 Equivalency.	75- 5		
Chapter 2 Referenced Publications	75- 5	Chapter 10 Records Kept or Stored in Information Technology Equipment Rooms	75- 15
2.1 General.	75- 5	10.1 Protection Required for Records Within the ITE Room.	75- 15
2.2 NFPA Publications.	75- 5	10.2 Records Stored Outside the ITE Room.	75- 15
2.3 Other Publications.	75- 6		
2.4 References for Extracts in Mandatory Sections. ...	75- 6	Chapter 11 Utilities	75- 15
Chapter 3 Definitions	75- 6	11.1 Heating, Ventilating, and Air Conditioning (HVAC).	75- 15
3.1 General.	75- 6	11.2 Coolant Systems.	75- 15
3.2 NFPA Official Definitions.	75- 6	11.3 Electrical Service.	75- 15
3.3 General Definitions.	75- 7	11.4 Supply Circuits and Interconnecting Cables.	75- 15
3.4 Aisle Containment.	75- 8	11.5 Uninterruptible Power Supplies (UPSs).	75- 16
Chapter 4 Fire Protection Approaches	75- 8	Chapter 12 Emergency and Recovery Procedures	75- 19
4.1 Fire Protection Approach.	75- 8	12.1 Emergency Fire Plan.	75- 19
4.2 Fire Risk Assessment.	75- 8	12.2 Damage Control Plan.	75- 19
4.3 Telecommunications Risks.	75- 9	12.3 Recovery Procedures Plan.	75- 19
Chapter 5 Performance-Based Design Approach	75- 9	Chapter 13 Modular Data Centers	75- 19
5.1 Performance-Based Design Approach.	75- 9	13.1 General.	75- 19
5.2 Goals and Objectives.	75- 9	13.2 (Reserved).	75- 19
5.3 Qualifications.	75- 9	13.3 (Reserved).	75- 19
5.4 Independent Review.	75- 9	13.4 Fire Protection Approaches.	75- 19
5.5 Final Determination.	75- 9	13.5 (Reserved).	75- 19
5.6 Maintenance of Design Features.	75- 9	13.6 Construction Requirements.	75- 19
5.7 Performance Criteria.	75- 9	13.7 Materials and Equipment Permitted in Modular Data Centers.	75- 19
Chapter 6 Construction Requirements	75- 9	13.8 (Reserved).	75- 19
6.1 Building Construction.	75- 9	13.9 Fire Protection and Detection Equipment.	75- 19
6.2 Combustibility of Materials.	75- 10	13.10 Records Kept or Stored in Modular Data Centers.	75- 20
6.3 Location of ITE Area Within the Building.	75- 10	13.11 Utilities.	75- 20
6.4 ITE Area Interior Construction Materials.	75- 10	13.12 Emergency and Recovery Procedures.	75- 20
6.5 Raised Floors.	75- 11		
6.6 Penetrations and Openings in Fire-Resistant-Rated Enclosures.	75- 11	Annex A Explanatory Material	75- 20
6.7 Aisle Containment and Hot Air Collar Systems for ITE.	75- 11	Annex B What to Do in the First 24 Hours for Damaged Electronic Equipment and Magnetic Media	75- 31
Chapter 7 Materials and Equipment Permitted in the Information Technology Equipment Area	75- 12	Annex C Risk Considerations, Business Interruption, and Temperature Considerations	75- 31
7.1 General.	75- 12	Annex D General Guidance for Gaseous Agent Systems in Information Technology Equipment Spaces	75- 32
7.2 Record Storage.	75- 12	Annex E Fire Detection for Information Technology Equipment Area Risks and Special Conditions	75- 33
7.3 General Storage.	75- 12	Annex F Informational References	75- 34
Chapter 8 Construction of Information Technology Equipment	75- 13	Index	75- 36
8.1 ITE.	75- 13		
8.2 Construction Features.	75- 13		
Chapter 9 Fire Protection and Detection Equipment	75- 13		
9.1 Automatic Fire Protection Systems.	75- 13		
9.2 Automatic Detection Systems.	75- 13		
9.3 Portable Extinguishers.	75- 14		
9.4 Gaseous Total Flooding Extinguishing Systems. ...	75- 14		

NFPA 75

Standard for the

Fire Protection of Information Technology Equipment

2020 Edition

IMPORTANT NOTE: This NFPA document is made available for use subject to important notices and legal disclaimers. These notices and disclaimers appear in all publications containing this document and may be found under the heading “Important Notices and Disclaimers Concerning NFPA Standards.” They can also be obtained on request from NFPA or viewed at www.nfpa.org/disclaimers.

UPDATES, ALERTS, AND FUTURE EDITIONS: New editions of NFPA codes, standards, recommended practices, and guides (i.e., NFPA Standards) are released on scheduled revision cycles. This edition may be superseded by a later one, or it may be amended outside of its scheduled revision cycle through the issuance of Tentative Interim Amendments (TIAs). An official NFPA Standard at any point in time consists of the current edition of the document, together with all TIAs and Errata in effect. To verify that this document is the current edition or to determine if it has been amended by TIAs or Errata, please consult the National Fire Codes® Subscription Service or the “List of NFPA Codes & Standards” at www.nfpa.org/docinfo. In addition to TIAs and Errata, the document information pages also include the option to sign up for alerts for individual documents and to be involved in the development of the next edition.

NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

A reference in brackets [] following a section or paragraph indicates material that has been extracted from another NFPA document. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced and extracted publications can be found in Chapter 2 and Annex F.

Chapter 1 Administration

1.1 Scope. This standard covers the requirements for the protection of information technology equipment (ITE) and ITE areas.

1.2* Purpose. The purpose of this standard is to set forth the minimum requirements for the protection of ITE equipment and ITE areas from damage by fire or its associated effects — namely, smoke, corrosion, heat, and water.

1.3* Application. The application of this standard is based on the risk considerations outlined in Chapter 4.

1.3.1 A documented risk assessment shall be the basis for implementation of this standard.

1.3.2 The mere presence of the ITE shall not constitute the need to invoke the requirements of this standard.

1.3.3 If applied, the requirements of this standard shall include the installation of ITE in modular data centers, fabricated containers, and other groupings.

1.4 Retroactivity.

1.4.1 The provisions of this standard reflect a consensus of what is necessary to provide an acceptable degree of protection from the hazards addressed in this standard at the time the standard was issued.

1.4.2 Unless otherwise specified, the provisions of this standard shall not apply to facilities, equipment, structures, or installations that existed or were approved for construction or installation prior to the effective date of the standard. Where specified, the provisions of this standard shall be retroactive.

1.5 Equivalency. Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard. Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency. The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

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 edition.

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

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*, 2018 edition.

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

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

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

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

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

NFPA 76, *Standard for the Fire Protection of Telecommunications Facilities*, 2020 edition.

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

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

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

NFPA 105, *Standard for Smoke Door Assemblies and Other Opening Protectives*, 2019 edition.

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

NFPA 232, *Standard for the Protection of Records*, 2017 edition.

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

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

ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, 2016a.

ASTM E814, *Standard Method of Fire Tests of Through-Penetration Fire Stops*, 2013a, reapproved 2017.

ASTM E1354, *Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter*, 2017.

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

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

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

ANSI/UL 72, *Standard for Tests for Fire Resistance of Record Protection Equipment*, 2015.

ANSI/UL 242, *Nonmetallic Containers for Waste Paper*, 2015.

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 1315, *Metal Waste Paper Containers*, 2017.

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

ANSI/UL 1564, *Standard for Industrial Battery Chargers*, 2014.

ANSI/UL 1778, *Uninterruptible Power Supply*, 2017.

ANSI/UL 1973, *Standard for Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications*, 2007.

ANSI/UL 9540, *Standard for Safety for Energy Storage Systems and Equipment*, 2016.

ANSI/UL 60950, *Safety of Information Technology Equipment*, 2000, including revisions through October 30, 2007.

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

ANSI/UL 62368-1, *Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements*, 2014.

2.3.3 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.

2.4 References for Extracts in Mandatory Sections.

NFPA 1, *Fire Code*, 2018 edition.

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

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

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

NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems*, 2019 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.3 Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

3.2.4* Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.5 Shall. Indicates a mandatory requirement.

3.2.6 Should. Indicates a recommendation or that which is advised but not required.

3.2.7 Standard. An NFPA Standard, the main text of which contains only mandatory provisions using the word “shall” to indicate requirements and that is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. When used in a generic sense, such as in the phrase “standards development process” or “standards development activities,” the term “standards” includes all NFPA Standards,

including Codes, Standards, Recommended Practices, and Guides.

3.3 General Definitions.

3.3.1 Abandoned Cables. Installed cables that are not terminated at equipment and not identified for future use with a tag.

3.3.2 Air Space. The space below a raised floor or above a suspended ceiling used to circulate environmental air within the ITE equipment room/ITE area.

3.3.3 Automated Information Storage System (AISS). An enclosed storage and retrieval system that moves recorded media between storage and ITE systems.

N 3.3.4 Battery Types Stationary.

N 3.3.4.1 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]

N 3.3.4.2 Nickel Cadmium (NiCd) Battery. An alkaline storage battery in which the positive active material is nickel oxide, the negative contains cadmium, and the electrolyte is potassium hydroxide. [1, 2018]

N 3.3.4.3* Valve-Regulated Lead Acid (VRLA). A lead-acid battery consisting of sealed cells furnished with a valve that opens to vent the battery whenever the internal pressure of the battery exceeds the ambient pressure by a set amount.

N 3.3.4.4* Vented (Flooded). A lead-acid battery consisting of cells that have electrodes immersed in liquid electrolyte.

3.3.5 Business Interruption. The effect on business operations from the time that equipment was initially lost or damaged until it has been restored to the former level of operation.

3.3.6 Communications Circuit. The circuit that extends voice, audio, video, data, interactive services, telegraph (except radio), outside wiring for fire alarm and burglar alarm from the communications utility to the customer's communications equipment up to and including terminal equipment such as a telephone, fax machine, or answering machine. [70:800.2]

3.3.7 Communications Equipment. The electronic equipment that performs the telecommunications operations for the transmission of audio, video, and data, and includes power equipment (e.g., dc converters, inverters, and batteries) and technical support equipment (e.g., computers), and conductors dedicated solely to the operation of the equipment. [70:100]

3.3.8 Detector.

3.3.8.1 Heat Detector. A fire detector that detects either abnormally high temperatures or rate of temperature rise, or both.

3.3.8.2 Smoke Detector. A device that senses visible or invisible particles of combustion.

3.3.9 Electronically Interconnected. Units that must be connected by a signal channel to complete a system or perform an operation.

3.3.10 Fire-Resistant-Rated Construction. Construction in which the structural members, including walls, partitions, columns, floors, and roof construction, have fire resistance ratings of time duration not less than that specified in this standard.

3.3.11 Fire Risk Analysis. A process to characterize the risk associated with fire that addresses the fire scenario or fire scenarios of concern, their probability, and their potential consequences.

3.3.12 Interconnecting Cables. Signal and power cables for operation and control of a system.

3.3.13* Information Technology Equipment (ITE). Equipment and systems rated 600 volts or less, normally found in offices or other business establishments and similar environments classified as ordinary locations, that are used for creation and manipulation of data, voice, video, and similar signals that are not communications equipment as defined in Part I of Article 100 and do not process communications circuits as defined in 800.2 [of NFPA 70]. [70:645.2]

3.3.14* ITE Area. An area of a building where the ITE room is located, including support rooms served by the same special air-conditioning/air-handling equipment as the ITE room.

3.3.15 ITE Room. A room within the ITE area that contains the ITE.

3.3.16* ITE System. Any electronic digital or analog computer, along with all peripheral, support, memory, programming, or other directly associated equipment, records, storage, and activities.

3.3.17 Material.

3.3.17.1 Combustible Material. A material that, in the form in which it is used and under the conditions anticipated, will ignite and burn; a material that does not meet the definition of noncombustible or limited-combustible.

3.3.17.2 Limited-Combustible Material. See 6.2.2.

3.3.17.3 Noncombustible Material. See 6.2.1.

N 3.3.17.4* Maximum Allowable Quantity (MAQ). The quantity of hazardous material permitted in a control area. [1, 2018]

N 3.3.18* Modular Data Center. Prefabricated units, rated 1000 volts or less, consisting of an outer enclosure housing multiple racks or cabinets of information technology equipment (ITE) (e.g., servers) and various support equipment, such as electrical service and distribution equipment, HVAC systems, and the like. [70:646.2]

3.3.19 Optical Fiber Cable. A factory assembly or field assembly of one or more optical fibers having an overall covering. [70:770.2]

3.3.20 Plenum. A compartment or chamber to which one or more ducts are connected and that forms part of the air distribution system. [90A, 2018]

3.3.21* Raceway. An enclosed channel of metallic or nonmetallic materials designed expressly for holding wires, cables, or busbars, with additional functions as permitted in NFPA 70.

3.3.22* Raised Floor. A platform with removable panels where equipment is installed, with the intervening space

between it and the main building floor used to house the interconnecting cables and at times is used as a means for supplying conditioned air to the ITE and the room.

3.3.23 Records.

3.3.23.1 Important Records. Records that could be reproduced only at considerable expense and labor or only after considerable delay.

3.3.23.2 Master Record. An information record on a medium that can be referred to whenever there is a need to rebuild a data base.

3.3.23.3 Vital Records. Records that are irreplaceable, such as records of which a reproduction does not have the same value as an original; records needed to sustain the business promptly or to recover monies used to replace buildings' equipment, raw materials, finished goods, and work in progress; and records needed to avoid delay in restoration of production, sales, and service.

3.3.24 Remote Disconnect Control. An electric device and circuit that controls a disconnecting means through a relay or equivalent device. [70:645.2]

3.3.25 Separate Fire Division. A portion of a building cut off from all other portions of the building by fire walls, fire doors, and other approved means adequate to prevent any fire that can occur in one fire division from extending to another fire division.

3.3.26* Support Equipment. Permanently installed equipment that is essential to the operation of ITE, as well as equipment temporarily used for maintenance, installation, or deinstallation of ITE.

N 3.3.27 Uninterruptible Power Supply (UPS). A device or system that provides quality and continuity of ac power through the use of a stored-energy device as the backup power source during any period when the normal power supply is incapable of performing acceptably. [111, 2019]

3.3.28 Water Sensor. A device or means that will detect the presence of water.

3.3.29 Zone. A physically identifiable area (such as barriers or separation by distance) within an ITE room, with dedicated power and cooling systems for the ITE or systems. [70:645.2]

3.4 Aisle Containment.

3.4.1* Aisle. The passageway between ITE or between ITE and a wall that allows personnel access to the ITE for service or operation of the equipment.

3.4.2* Aisle Containment. An HVAC method deployed in the occupied area of an air-cooled ITE space utilizing physical separation of hot exhaust air from cooler intake air between equipment cabinets, rows of ITE, or associated power and cooling infrastructure; containment is typically above and at both ends of a hot aisle or a cold aisle, in whole or part.

3.4.3* Cold Aisle. The aisle in front of the airflow intakes on the ITE where HVAC cooling airflow is controlled.

3.4.4* Hot Air Collar. An air conveyance assembly used to direct heated exhaust air from ITE cabinet(s), enclosure(s), or rack(s) directly to a return air path.

3.4.5* Hot Aisle. The aisle at the rear of the ITE where heated exhaust air is controlled and directed into the aisle for return to the HVAC equipment.

Chapter 4 Fire Protection Approaches

4.1 Fire Protection Approach. The fire protection approach for ITE systems, ITE rooms, and ITE areas shall be permitted to be determined based on an evaluation of fire risks and hazards associated with the site and services provided and the business continuity planning and disaster restoration capabilities of the ITE specific to the site.

4.1.1 The fire protection approach shall be established with consideration given to the following factors:

- (1) Exposure threat to facility occupants, the general public, emergency responders, and exposed property from a fire occurring at the facility, adjacent to or within ITE areas
- (2) The importance of the continuity of the data being stored or processed by the ITE
- (3) Methods and equipment employed as part of a risk management or business continuity strategy that allow data to remain viable during and after an event or to be replaced or restored
- (4) The potential for a given protection strategy to result in a service or data disruption or inhibit the ability of the data provider to restore operation and access to the data in a timely manner post-event

4.1.2 The fire protection approach shall be developed in conjunction with the considerations in 4.2.3 resulting in the use of one or both of the following strategies within ITE areas:

- (1) Prescriptive-based approaches in accordance with this standard
- (2) A fire risk-based approach in accordance with 4.1.3 and Section 4.2

4.1.3 A fire risk-based approach shall be permitted to be used to determine the construction, fire suppression, fire detection, and utility requirements for ITE systems, ITE rooms, and ITE areas where specifically permitted by this standard that are necessary to achieve the purpose of this standard. (See Section 1.2.)

4.2 Fire Risk Assessment.

4.2.1* The fire risk assessment permitted by 4.1.2 shall be documented and acceptable to the authority having jurisdiction (AHJ).

4.2.2 The fire risk assessment shall include an evaluation of the risk management considerations outlined in 4.2.3.

4.2.3* The following elements shall be considered to determine the level of acceptable fire risk documented as part of the fire risk assessment (see also Annex C):

- (1) Life safety aspects of the function (e.g., process controls, air traffic controls)
- (2) Fire threat of the installation to occupants or exposed property
- (3) Continuity of service, operation, and data access
- (4) Size and value of the ITE areas
- (5) Economic loss from loss of function or loss of records
- (6) Economic loss from value of equipment
- (7) Loss of customer data hosted on ITE
- (8) Regulatory impact

- (9) Reputation impact
- (10) Construction and compartmentation of the ITE areas
- (11) Fire suppression and detection features provided for the ITE areas
- (12) Response time to an alarm
- (13) Local fire-fighting capabilities
- (14) Redundant infrastructure, including off-site processing systems
- (15) Life safety of occupants of ITE areas and adjacent spaces, emergency responders, and general public

4.2.4 The fire risk assessment shall cover the entire ITE area, including all adjacent exposures.

4.2.5 An approved performance-based approach, in accordance with Chapter 5, shall be permitted to be applied selectively to specifically identified areas, hazards, or equipment or to specific fire protection requirements for an entire ITE area.

4.3 Telecommunications Risks.

4.3.1 Telecommunications Risks for the Private Network.

4.3.1.1 To assess and evaluate the damage and interruption potential of the loss of ITE room operations, a risk evaluation shall be conducted on the impact of the loss of data and communications.

4.3.1.2 The provisions of this standard shall apply to those areas housing telecommunications equipment that are part of a private network or where the need for protection has been determined by the risk evaluation outlined in 4.3.1.1.

4.3.2 Telecommunications Risks for the Public Networks.

4.3.2.1 NFPA 76 shall apply to telecommunications facilities that are part of the public network as outlined in the scope of NFPA 76.

4.3.2.2 The provisions of this standard shall not apply to telecommunications facilities that are part of the public network.

Chapter 5 Performance-Based Design Approach

5.1 Performance-Based Design Approach. The requirements of Chapter 5 shall apply to recognize performance-based practices.

5.2 Goals and Objectives. The performance-based design shall meet the following goals and objectives:

- (1) The performance-based approach allows the alternative means to be utilized for the elements of the ITE systems, ITE rooms, and ITE areas as permitted in this standard.
- (2) The risk analysis, design criteria, design brief, system performance, and testing criteria are developed in accordance with this section.
- (3) The design meets the scope and purpose of the standard as detailed in Sections 1.1 and 1.2.
- (4) The performance-based design provides equivalent performance to the prescriptive requirements of this standard.

5.3* Qualifications. The performance-based design documents shall be prepared by a licensed design professional with experience in fire protection, and acceptable to the AHJ.

5.4* Independent Review. The AHJ shall be permitted to require an approved, independent third party to review the

proposed design brief based on the documented fire risk assessment accepted by the AHJ to provide an evaluation of the design.

5.5 Final Determination. The authority having jurisdiction shall make the final determination as to whether the performance objectives have been met.

5.6 Maintenance of Design Features. The design features required for the ITE area to continue to meet the performance goals and objectives of this standard shall be maintained for the life of the building.

5.7 Performance Criteria.

5.7.1 General. All designs shall meet the goals and objectives specified in Section 5.2 and provided that the performance criterion of 5.7.2 is met and the design team concurs with the design and with the risk management considerations in 4.2.3.

5.7.2 Performance Criterion. The performance criterion shall include the protection of ITE systems and ITE areas from damage by fire or its associated effects, including smoke, corrosion, heat, and water.

5.7.3 Design Team. The design team shall comprise the design professional, the owner or owner's representative, representatives of the authority having jurisdiction, and representatives of the emergency response entities.

5.7.4* Design Brief. The design of the ITE area shall include the preparation of a design brief that is prepared utilizing recognized performance-based design practices.

5.7.4.1 Any deviation from a prescriptive requirement shall be detailed in the design brief.

5.7.4.2 Design specifications and briefs used in the performance-based design shall be clearly stated and shown to be realistic and sustainable.

5.7.4.3 Specific inspection, testing, or maintenance requirements that are necessary to maintain reliable performance of the fire safety features of the information technology area shall be stated in the design brief.

Chapter 6 Construction Requirements

6.1* Building Construction.

6.1.1 The ITE area shall be housed in a fully sprinklered building in accordance with NFPA 13 or housed in one of the following:

- (1) A building constructed in accordance with NFPA 220 Type I (443) or (332), or Type II (222) or (111) (*for nonsprinklered buildings, see 9.1.1*)
- (2) A single-story building constructed in accordance with NFPA 220 Type II (000) (*for nonsprinklered buildings, see 9.1.1.1*)

6.1.1.1 The building construction requirements in 6.1.1 shall be permitted to be modified where a risk assessment, as outlined in Chapter 4, identifies that an alternative means of construction is acceptable.

6.1.2* Protection for the building housing the ITE area shall be provided where it is subject to damage from external exposure.

6.1.3* The ITE area shall be separated from other occupancies within the building, including atria or other open-space construction, by fire-resistant-rated construction.

6.1.3.1 The ITE room shall be separated from other occupancies in the ITE area by fire-resistant-rated construction.

6.1.3.2 The fire resistance rating shall be commensurate with the exposure but not less than 1 hour for both.

6.1.3.3 The fire-resistant-rated enclosures shall extend from the structural floor to the structural floor above or to the roof.

6.1.3.4 Every opening in the fire-resistant-rated construction shall be protected to limit the spread of fire and to restrict the movement of smoke from one side of the fire-resistant-rated construction to the other. The fire resistance rating for doors shall be as follows:

- (1) 2-hour fire-resistant-rated construction — 1½-hour fire-resistance-rated doors
- (2) 1-hour fire-resistant-rated construction — ¾-hour fire-resistance-rated doors

6.1.3.5 The fire-resistant-rated construction shall be in accordance with NFPA 101 and applicable building and fire codes.

Δ 6.1.3.6 Under the following conditions, the fire separation requirements of 6.1.3 through 6.1.3.4 shall be permitted to be evaluated as part of the risk assessment as outlined in Chapter 4:

- (1) The anticipated fire exposures are documented.
- (2) Alternate forms of fire separation are provided based on the anticipated fire exposures.

6.2* Combustibility of Materials.

6.2.1 Noncombustible Material. [101:4.6.13]

6.2.1.1 A material that complies with any of the following shall be considered a noncombustible material:

- (1)* A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat
- (2) A material that is reported as passing ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*
- (3) A material that is reported as complying with the pass/fail criteria of ASTM E136 when tested in accordance with the test method and procedure in ASTM E2652, *Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-Shaped Airflow Stabilizer, at 750°C*

[101:4.6.13]

6.2.1.2 Where the term *limited-combustible* is used in this standard, it shall also include the term *noncombustible*. [101:4.6.13.2]

6.2.2 Limited-Combustible Material. A material shall be considered a limited-combustible material where one of the conditions of 6.2.2.1 and 6.2.2.2, and the conditions of either 6.2.2.3 or 6.2.2.4, are met. [101:4.6.14]

Δ 6.2.2.1 The material shall not comply with the requirements for noncombustible material in accordance with 6.2.1. [101:4.6.14.1]

6.2.2.2 The material, in the form in which it is used, shall exhibit a potential heat value not exceeding 3500 Btu/lb (8141

kJ/kg) where tested in accordance with NFPA 259. [101:4.6.14.2]

Δ 6.2.2.3 The material shall have the structural base of a noncombustible material with a surfacing not exceeding a thickness of ⅛ in. (3.2 mm) where the surfacing exhibits a flame spread index not greater than 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*. [101:4.6.14.3]

6.2.2.4* The material shall be composed of materials that, in the form and thickness used, neither exhibit a flame spread index greater than 25 nor evidence of continued progressive combustion when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, and shall be of such composition that all surfaces that would be exposed by cutting through the material on any plane would neither exhibit a flame spread index greater than 25 nor exhibit evidence of continued progressive combustion when tested in accordance with ASTM E84 or ANSI/UL 723. [101:4.6.14.4]

6.2.2.5 Where the term *limited-combustible* is used in this standard, it shall also include the term *noncombustible*. [101:4.6.14.5]

6.3 Location of ITE Area Within the Building.

6.3.1* The ITE area shall not be located above, below, or adjacent to areas or other structures where hazardous processes are located unless approved protective features are provided.

6.3.2* Access to the ITE area shall be restricted to authorized persons.

6.3.3* A structural floor where an ITE system is located or that supports a raised floor installation shall incorporate provisions to allow for removal of leaks from chilled water, heating water, steam condensate, domestic water, liquid coolants, or water from sprinklers or fire-fighting operations.

6.3.3.1* One or more of the following methods shall be used for liquid removal:

- (1) Floor drain(s)
- (2) Liquid containment with removal pumps
- (3) Alternate methods as approved by the AHJ

6.3.3.2* Underfloor spaces shall be provided with a leak detection system where any utility fluids or computer auxiliary cooling fluids are piped into the ITE room or are capable of entering the room from adjoining areas.

6.3.4 Where an alternate solution, such as containment with leak detection, is provided, the drainage requirements in 6.3.3 shall be permitted to be evaluated as part of the performance-based risk analysis as outlined in Chapters 4 and 5.

6.4 ITE Area Interior Construction Materials.

6.4.1 All interior wall and ceiling finishes in the ITE area shall have a Class A rating in accordance with NFPA 101.

6.4.1.1 Interior wall and ceiling finishes in fully sprinklered ITE areas shall be permitted to be Class B in accordance with NFPA 101.

6.4.1.2 Interior floor finishes used in ITE areas shall be Class I in accordance with NFPA 101.

6.4.1.2.1 Interior floor finishes in fully sprinklered ITE areas shall be permitted to be Class II in accordance with NFPA 101.

6.4.1.3 Exposed cellular plastics shall not be used in ITE area construction.

6.5* Raised Floors. Where raised floors are used, they shall comply with 6.5.1 through 6.5.4.

6.5.1 Structural supporting members for raised floors shall be of noncombustible material.

6.5.2 Decking for raised floors shall be one of the following:

- (1) Noncombustible
- (2) Pressure-impregnated, fire-retardant-treated lumber having a flame spread index of 25 or less in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*
- (3) Wood or similar core material that is encased on the top and bottom with sheet, cast, or extruded metal, with all openings or cut edges covered with metal or plastic clips or grommets so that none of the core is exposed, and that has an assembly flame spread index of 25 or less in accordance with ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*

6.5.3 Access sections or panels shall be provided in raised floors so that all the space beneath is accessible. Tools needed to provide access to the underfloor space shall be located in the room, and their location shall be well marked.

6.5.4* Electric cable openings in floors shall be made smooth or shall be otherwise protected to preclude the possibility of damage to the cables.

6.6 Penetrations and Openings in Fire-Resistant-Rated Enclosures.

Δ 6.6.1 Cable penetrations or other penetrations through required fire-rated assemblies shall be firestopped with a listed firestop system that has a rating as specified in 6.6.1.1 and 6.6.1.2 where tested with minimum positive furnace pressure differential of 2.5 Pa (0.01 in. of water) under ASTM E814, *Standard Method of Fire Tests of Through-Penetration Fire Stops*, or ANSI/UL 1479, *Standard for Fire Tests of Penetration Firestops*.

N 6.6.1.1 F Ratings. Firestop systems and devices shall have an F rating of not less than 1 hour, and not less than the required fire resistance rating of the barrier penetrated. [101:8.3.4.2.3]

N 6.6.1.2 T Ratings. Penetrations in fire resistance-rated horizontal assemblies shall have a T rating of not less than 1 hour, and not less than the fire resistance rating of the horizontal assembly. [101:8.3.4.2.4.1]

N 6.6.1.2.1 A T rating shall not be required for either of the following:

- (1) Floor penetrations contained within the cavity of a wall assembly
 - (2) Penetrations through floors or floor assemblies where the penetration is not in direct contact with combustible material
- [101:8.3.4.2.4.2]

6.6.2 Pass-throughs or windows located in fire-resistant-rated construction shall be equipped with an automatic fire-rated shutter, a service counter fire door, or fire-rated windows installed and maintained in accordance with NFPA 80.

6.6.2.1 The shutters, service counter door, or windows shall be operated automatically by the presence of either smoke or fire on either side of the wall.

6.6.2.2 The fire rating of the shutters, service counter door, or windows shall not be less than the fire rating of the wall in which it is located.

6.6.3 All air ducts and air transfer openings passing through fire-resistant-rated construction shall be provided with automatic fire and smoke dampers.

6.6.3.1* Fire and smoke dampers shall be installed in accordance with NFPA 90A.

6.6.3.2 Fire dampers shall be maintained in accordance with NFPA 80.

6.6.3.3 Smoke dampers and combination fire/smoke dampers shall be maintained in accordance with NFPA 105.

6.7* Aisle Containment and Hot Air Collar Systems for ITE.

6.7.1 Aisle containment and hot air collar systems shall be permitted to be one of the following:

- (1) Factory-packaged and aftermarket: systems designed, provided, and installed in accordance with the manufacturer's instructions
- (2) Field-constructed: systems designed and constructed using common construction materials

6.7.2 Both types of aisle containment systems shall comply with 6.7.3 through 6.7.10.1.

6.7.3 Elements of aisle containment and hot air collars shall be constructed of materials that have a maximum flame spread index of 50 and a maximum smoke development of 450 in accordance with one or more of the following:

- (1) ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*
- (2) ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*

6.7.4* Aisle containment systems and hot air collars shall not be considered to be plenums.

6.7.5 Aisle containment systems shall be permitted to be applied to hot aisles or cold aisles of ITE.

6.7.6* Detection and suppression components within aisle containment systems shall be rated for the intended temperatures of hot aisles when installed in those locations.

6.7.7 Where aisle containment systems are installed, the existing suppression and detection systems shall be evaluated, modified, and tested as necessary to maintain compliance with the applicable codes and standards.

6.7.8 Where automatic sprinklers are present and the application of aisle containment systems or hot air collars creates obstructions to proper operation of sprinkler systems, the sprinkler system shall be modified as necessary to comply with NFPA 13.