

**NFPA® 75**  
Standard for the  
Protection of Information Technology Equipment  
2009 Edition

NFPA and National Fire Protection Association are registered trademarks of the National Fire Protection Association, Quincy, Massachusetts 02169.

Copyright © 2008 National Fire Protection Association®. All Rights Reserved.

This edition of NFPA 75, *Standard for the Protection of Information Technology Equipment*, was prepared by the Technical Committee on Electronic Computer Systems and acted on by NFPA at its June Association Technical Meeting held June 27, 2008, in Las Vegas, NV. It was issued by the Standards Council on July 24, 2008, with an effective date of September 5, 2008, and supersedes all previous editions.

This edition of NFPA 75 was approved as an American National Standard on September 5, 2008.

### **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  
Copyright NFPA

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 揺 lectronic computer/data processing equipment? and 揺 lectronic computer system? were used where the current terms 搥nformation technology equipment? and 搥nformation technology equipment system,? respectively, are used. Similarly, the terms 挿 omputer room? and 挿 omputer area? were replaced by 搥nformation technology equipment room? and 搥nformation technology equipment area,? respectively. While the title and some terminology were changed in the 2003 edition to more closely align this standard 搥 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, has been updated; many of the UL references have been updated; new requirements have been added for signage to indicate that equipment will remain energized where continuous power is provided; and flame spread indexes have been provided for many of the materials listed in the standard.

### **Technical Committee on Electronic Computer Systems**

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

**Joseph A. Spataro**, *Secretary*  
Fireman's Fund Insurance Company, NY [I]

**Bernhard G. Bischoff**, Chemetron Fire Systems, IL [M]  
Rep. Fire Suppression Systems Association

**Alastair R. Brown**, Rushbrook Consultants, Ltd., Scotland [SE]

**Thomas M. Burke**, Underwriters Laboratories Inc., CA [RT]

Copyright NFPA

**Thomas M. Child, Jr.,** Aon Risk Services, Inc., NJ [I]

**Thomas G. Deegan,** The Viking Group, Inc., MI [M]  
Rep. National Fire Sprinkler Association

**Jerry D. Dempster,** Tyco/SimplexGrinnell, TX [M]

**Thomas Goonan,** Tom Goonan Associates, VA [SE]

**Robert L. Langer,** Amerex Corporation, AL [M]  
Rep. Fire Equipment Manufacturers' Association

**Ronald Marts,** Telcordia Technologies, NJ [U]  
Rep. Alliance for Telecommunications Industry Solutions

**Stephen McCluer,** American Power Conversion Corporation, TX [U]

**Frank Peri,** Communications Design Corporation, FL [SE]

**George A. Petrou,** JP Morgan Chase & Company, NJ [U]

**Robert M. Pikula,** Reliable Fire Equipment Company, IL [IM]  
Rep. National Association of Fire Equipment Distributors

**Keith J. Polasko,** U.S. National Security Agency, MD [E]

**Joseph Radakovich, Jr.,** U.S. Department of Defense, VA [U]

**Brian P. Rawson,** International Business Machines (IBM), NY [U]

Copyright NFPA

**Mark Rochholz**, Schirmer Engineering Corporation, IL [I]

**Henry J. Roux**, Roux International Inc., PA [SE]

**Sam Sat Salwan**, Environmental Systems Design, Inc., IL [SE]

**Timothy J. Smith**, Recovery Management Services, IL [U]

**David Zolotar**, Sun Microsystems, Inc., CO [M]  
Rep. Information Technology Industry Council

#### **Alternates**

**Kerry M. Bell**, Underwriters Laboratories Inc., IL [RT]  
(Alt. to T. M. Burke)

**Timothy Carman**, Tyco Safety Products/Ansul, Inc., OR [M]  
(Alt. to J. D. Dempster)

**Win Chaiyabhat**, Aon Risk Services, ME [I]  
(Alt. to T. M. Child, Jr.)

**Richard P. Puig**, Fike Corporation, TX [M]  
(Alt. to B. G. Bischoff)

**Walter H. Schmoeller**, U.S. National Security Agency, MD [E]  
(Alt. to K. J. Polasko)

**Robert V. Scholes**, Fireman's Fund Insurance Company, CA [I]  
Copyright NFPA

(Alt. to J. A. Spataro)

**Richard B. Swartz**, JP Morgan Chase & Company, NY [U]

(Alt. to G. A. Petrou)

**Randy Willard**, U.S. Central Intelligence Agency, MD [U]

(Alt. to J. Radakovich, Jr.)

### **Nonvoting**

**Edward D. Leedy**, Naperville, IL

(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.

## **NFPA 75 Standard for the Protection of Information Technology Equipment**

Copyright NFPA

## 2009 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 Documents.** They can also be obtained on request from NFPA or viewed at [www.nfpa.org/disclaimers](http://www.nfpa.org/disclaimers).***

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

Changes other than editorial are indicated by a vertical rule beside the paragraph, table, or figure in which the change occurred. These rules are included as an aid to the user in identifying changes from the previous edition. Where one or more complete paragraphs have been deleted, the deletion is indicated by a bullet (•) between the paragraphs that remain.

A reference in brackets [ ] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, the complete title and edition of the source documents for extracts in mandatory sections of the document are given in Chapter 2 and those for extracts in informational sections are given in Annex E. 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 publications can be found in Chapter 2 and Annex E.

## Chapter 1 Administration

### 1.1 Scope.

This standard covers the requirements for the protection of information technology equipment and information technology equipment areas.

### 1.2\* Purpose.

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

Copyright NFPA

### **1.3 Application.**

The application of this standard is based on the risk considerations outlined in Chapter 4. The mere presence of the information technology equipment shall not constitute the need to invoke the requirements of this standard.

### **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.

### **1.6 Special Note on Chapter 10.**

Chapter 10 contains text extracted from *NFPA 70, National Electrical Code*, Article 645. The text is identified by a citation in brackets following the paragraph. Only editorial changes were made to make the text consistent with this standard. Requests for interpretations or revisions of the extracted text will be referred to Panel No. 12 of the National Electrical Code Committee.

## **Chapter 2 Referenced Publications**

### **2.1 General.**

Copyright NFPA

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 10, *Standard for Portable Fire Extinguishers*, 2007 edition.

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*, 2008 edition.

NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems*, 2009 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2007 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*, 2007 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, 2008 edition.

NFPA 70®, *National Electrical Code®*, 2008 edition.

NFPA 72®, *National Fire Alarm Code®*, 2007 edition.

NFPA 76, *Standard for the Fire Protection of Telecommunications Facilities*, 2009 edition.

NFPA 101®, *Life Safety Code®*, 2009 edition.

NFPA 220, *Standard on Types of Building Construction*, 2009 edition.

NFPA 232, *Standard for the Protection of Records*, 2007 edition.

NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, 2006 edition.

NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*, 2008 edition.

## **2.3 Other Publications.**

Copyright NFPA



### 2.3.1 ASTM Publications.

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

ASTM E 84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, 2007.

ASTM E 136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, 1999.

ASTM E 814, *Standard Method of Fire Tests of Through-Penetration Fire Stops*, 1997.

### 2.3.2 UL Publications.

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

UL 72, *Standard for Tests for Fire Resistance of Record Protection Equipment*, 2001, including revisions through August 18, 2005.

UL 478, *Standard for Electronic Data-Processing Units and Systems*, 1980.

UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, 2003.

UL 900, *Standard for Air Filter Units*, 2004.

UL 1950, *Standard for Safety of Information Technology Equipment*, 1995.

UL 60950, *Safety of Information Technology Equipment*, 2000.

UL 60950-1, *Information Technology Equipment ? Safety ? Part 1: General Requirements*, 2003.

### 2.3.3 Other Publications.

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

## 2.4 References for Extracts in Mandatory Sections.

NFPA 70®, *National Electrical Code®*, 2008 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.

### 3.3 General Definitions.

**3.3.1** Air Space. The space below a raised floor or above a suspended ceiling used to circulate environmental air within the information

technology equipment room/information technology equipment area.

**3.3.2** Automated Information Storage System (AISS). An enclosed storage and retrieval system that moves recorded media between storage and information technology equipment systems.

**3.3.3** 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.

**3.3.4** Console. A unit containing main operative controls of the system.

**3.3.5** Detector.

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

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

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

**3.3.7** 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.

**3.3.8** Information Technology Equipment Area. An area of a building where the information technology equipment room is located, including support rooms served by the same special air-conditioning/air-handling equipment as the information technology equipment room.

**3.3.9** Information Technology Equipment Room. A room within the information technology equipment area that contains the information technology equipment.

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

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

**3.3.12** Noncombustible. A material that, in the form in which it is used and under the conditions anticipated, will not aid combustion or add appreciable heat to an ambient fire. Materials, when tested in accordance with ASTM E 136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, and conforming to the criteria contained in Section 8 of the referenced standard, are considered as

noncombustible.

**3.3.13\*** 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 information technology equipment and the room.

**3.3.14** Records.

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

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

**3.3.14.3** 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.

**3.3.15** 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.

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

## Chapter 4 Risk Considerations

### 4.1 Risk Factors.

The following factors shall be considered in determination of the need for protecting the environment, equipment, function, programming, records, and supplies (*see 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) Economic loss from loss of function or loss of records

Copyright NFPA

- (4) Economic loss from value of equipment
- (5) Regulatory impact
- (6) Reputation impact

## **4.2 Telecommunications Risks.**

### **4.2.1 Telecommunications Risks for the Private Network.**

**4.2.1.1** In assessing and evaluating the damage and interruption potential of the loss of information technology equipment room operations, attention shall be given to the impact of the loss of data and communications.

**4.2.1.2** If these functions are vital to the operation, the provisions of this standard shall apply to those areas housing telecommunications equipment.

**4.2.2** NFPA 76, *Standard for the Fire Protection of Telecommunications Facilities*, shall apply to telecommunications facilities that are part of the public network as outlined in the scope of NFPA 76, and the provisions of this standard shall not apply.

## **Chapter 5 Construction Requirements**

### **5.1\* Building Construction.**

**5.1.1** The information technology equipment area shall be housed in a fully sprinklered building in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, or housed in one of the following:

- (1) A building constructed in accordance with NFPA 220, *Standard on Types of Building Construction*, Type I (443) or (332), or Type II (222) or (111) (*for nonsprinklered buildings, see 8.1.1.2*)
- (2) A single-story building constructed in accordance with NFPA 220, *Standard on Types of Building Construction*, Type II (000) (*for nonsprinklered buildings, see 8.1.1.2*)

**5.1.2\*** Protection for the building housing the information technology equipment area shall be provided where it is subject to damage from

Copyright NFPA

external exposure.

**5.1.3\*** The information technology equipment area shall be separated from other occupancies within the building, including atria or other open-space construction, by fire-resistant-rated construction. The information technology equipment room shall be separated from other occupancies in the information technology equipment area by fire-resistant-rated construction. The fire resistance rating shall be commensurate with the exposure but not less than 1 hour for both.

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

**5.1.3.2** 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 ? 1 ? hour fire-resistance-rated doors
- (2) 1-hour fire-resistant-rated construction ? ? hour fire-resistance-rated doors

## **5.2\* Location of Information Technology Equipment Area Within the Building.**

The information technology equipment 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.

## **5.3 Information Technology Equipment Area Interior Construction Materials.**

**5.3.1** All interior wall and ceiling finishes in the information technology equipment area shall have a Class A rating in accordance with NFPA 101, *Life Safety Code*.

**5.3.1.1** Interior wall and ceiling finishes in fully sprinklered information technology equipment areas shall be permitted to be Class B in accordance with NFPA 101, *Life Safety Code*.

**5.3.1.2** Interior floor finishes used in information technology equipment areas shall be Class I in accordance with NFPA 101, *Life Safety Code*.

**5.3.1.2.1** Interior floor finishes in fully sprinklered information technology equipment areas shall be permitted to be Class II in accordance with NFPA 101, *Life Safety Code*.

**5.3.1.3** Exposed cellular plastics shall not be used in information technology equipment area construction.

**5.3.2\*** A structural floor where an information technology equipment system is located or that supports a raised floor installation shall incorporate provisions for drainage from domestic water leakage, sprinkler operation, coolant leakage, or fire-fighting operations.

#### **5.4\* Raised Floors.**

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

**5.4.2** 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 NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, ASTM E 84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or 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 NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, or UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*

**5.4.3** 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.

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

#### **5.5 Penetrations of Fire-Resistant-Rated Enclosures.**

**5.5.1** Cable openings or other penetrations through required fire-rated assemblies shall be fire stopped with a listed fire-stopping material that has a fire resistance rating equal to the fire resistance rating of the penetrated barrier where tested with a minimum positive furnace pressure differential of 2.5 Pa (0.01 in. of water) under ASTM E 814, *Standard Method of Fire Tests of Through-Penetration Fire Stops*.

**5.5.2** Where any pass-throughs or windows are provided in any fire-rated wall of an information technology equipment area, each opening shall

Copyright NFPA

be equipped with an automatic fire-rated shutter or a fire-rated window of equal rating to the wall.

**5.5.2.1** The shutter shall be operated automatically by the presence of either smoke or fire on either side of the wall.

**5.5.3** The air ducts shall be provided with automatic fire and smoke dampers where the ducts pass through fire-resistant-rated construction.

## **5.6 Air Space.**

Where the air space below a raised floor or above a suspended ceiling is used to recirculate information technology equipment room/information technology equipment area environmental air, the wiring shall conform to Article 645 of *NFPA 70, National Electrical Code*.

# **Chapter 6 Materials and Equipment Permitted in the Information Technology Equipment Area**

## **6.1 General.**

**6.1.1\*** Only information technology equipment and support equipment shall be permitted in the information technology equipment room.

**6.1.1.1** Small supervisory offices and similar light-hazard occupancies directly related to the electronic equipment operations shall be permitted within the information technology equipment room if noncombustible containers are provided for combustible material.

**6.1.1.2** Records shall be permitted in the information technology equipment room to the extent allowed in Chapter 9.

**6.1.2** Office furniture in the information technology equipment room shall be of metal construction.

**6.1.2.1** Metal frame chairs with integral seat cushions shall be permitted.

**6.1.2.2** Insulated or controlled conductive coverings shall be permitted on surfaces of chairs, tables, desks, and so forth.

**6.1.3** Only approved self-extinguishing-type trash receptacles shall be used in the information technology equipment area.

## **6.2 Record Storage.**

**6.2.1** The amount of records within the information technology equipment room shall be kept to the absolute minimum required for essential



and efficient operation.

**6.2.1.1** Only records that are essential to the information technology equipment operations shall be permitted to be kept in the information technology equipment room.

**6.2.1.2** An automated information storage system (AISS) conforming to the requirements of 8.1.4 shall be permitted in the information technology equipment room.

**6.2.2** Tape libraries and record storage rooms within the information technology equipment area shall be protected by an extinguishing system and separated from the information technology equipment room and other portions of the information technology equipment area by fire-resistant-rated construction. The fire resistance rating shall be commensurate with the exposure but not less than 1 hour.

**6.2.3** The records storage room shall be used only for the storage of records.

**6.2.3.1** All other operations, including splicing, repairing, erasing, reproducing, cataloging, and so forth, shall be prohibited in this room.

**6.2.3.2** Spare media shall be permitted to be stored in this room if they are unpacked and stored in the same manner as the media containing records.

### **6.3 General Storage.**

**6.3.1** Paper stock, inks, unused recording media, and other combustibles within the information technology equipment room shall be restricted to the absolute minimum necessary for efficient operation. Any such materials in the information technology equipment room shall be kept in totally enclosed metal file cases or cabinets or, if provided for in individual machine design, shall be limited to the quantity prescribed and located in the area designated by the equipment manufacturer.

**6.3.2** Reserve stocks of paper, inks, unused recording media, and other combustibles shall be stored outside the information technology equipment room.

**6.3.3** The space beneath the raised floor shall not be used for storage purposes.

## **Chapter 7 Construction of Information Technology Equipment**

## 7.1 Information Technology Equipment.

**7.1.1** Equipment and replacement parts shall meet the requirements of UL 478, *Standard for Electronic Data-Processing Units and Systems*; UL 1950, *Standard for Safety of Information Technology Equipment*; UL 60950, *Safety of Information Technology Equipment*; or UL 60950-1, *Information Technology Equipment ? Safety ? Part I: General Requirements*.

**7.1.2\*** Each individual unit shall be constructed in such a way that by limiting combustible materials or by use of enclosures, fire is not likely to spread beyond the unit where the source of ignition is located. Automatic protection shall be provided for all units not so constructed.

**7.1.3** Listed information technology equipment shall be considered as meeting the requirements of 7.1.2.

**7.1.4\*** Enclosures of floor-standing equipment having external surfaces of combustible materials of such size that can contribute to the spread of an external fire shall have a flame spread index of 50 or less in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*; ASTM E 84, *Standard Test Method for Surface Burning Characteristics of Building Materials*; or UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*. Equipment conforming to the requirements of UL 478, *Standard for Electronic Data-Processing Units and Systems*; UL 1950, *Standard for Safety of Information Technology Equipment*; or UL 60950, *Safety of Information Technology Equipment*, shall be considered as meeting the requirements of 7.1.4.

**7.1.4.1** Equipment conforming to the requirements of UL 478, *Standard for Electronic Data-Processing Units and Systems*; UL 1950, *Standard for Safety of Information Technology Equipment*; UL 60950, *Safety of Information Technology Equipment*; or UL 60950-1, *Information Technology Equipment ? Safety ? Part I: General Requirements*, shall be considered as meeting the requirements of 7.1.4.

## 7.2 Construction Features.

**7.2.1 Filters.** Air filters for use in the cooling systems of individual units shall be listed. The air filters shall be arranged in such a way that they can be removed, inspected, cleaned, or replaced when necessary.

**7.2.2 Liquids.** If the design of the unit is such that oil or equivalent liquid is required for lubrication, cooling, or hydraulic purposes, it shall have a closed-cup flash point of 149°F (300°C) or higher, and the container shall be of a sealed construction, incorporating automatic pressure relief devices.

**7.2.3 Acoustical Materials.** All sound-deadening material used inside information technology equipment shall be of such material, or so

arranged, that it does not increase the potential of fire damage to the unit or the potential of fire propagation from the unit.

## Chapter 8 Fire Protection and Detection Equipment

### 8.1 Automatic Sprinkler Systems.

**8.1.1** Information technology equipment rooms and information technology equipment areas located in a sprinklered building shall be provided with an automatic sprinkler system.

**8.1.1.1** Information technology equipment rooms and information technology equipment areas located in a nonsprinklered building shall be provided with an automatic sprinkler system, a gaseous clean agent extinguishing system, or both (*see Section 8.4*).

**8.1.1.2\*** An automatic sprinkler system, a carbon dioxide extinguishing system, or an inert agent fire extinguishing system for the protection of the area below the raised floor in an information technology equipment room or information technology equipment area shall be provided.

**8.1.2\*** Automatic sprinkler systems protecting information technology equipment rooms or information technology equipment areas shall be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

**8.1.3** Sprinkler systems protecting information technology equipment areas shall be valved separately from other sprinkler systems.

**8.1.4\*** Automated information storage system (AISS) units containing combustible media with an aggregate storage capacity of more than 0.76 m<sup>3</sup> (27 ft<sup>3</sup>) shall be protected within each unit by an automatic sprinkler system or a gaseous agent extinguishing system with extended discharge.

**8.1.5** Automatic sprinkler systems protecting information technology equipment rooms or information technology equipment areas shall be maintained in accordance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*.

### 8.2\* Automatic Detection Systems.

Automatic detection equipment shall be installed to provide early warning of fire. The equipment used shall be a listed smoke detection system and shall be installed and maintained in accordance with NFPA 72, *National Fire Alarm Code*.

**8.2.1\*** Automatic detection systems shall be installed in the following locations:

- (1) At the ceiling level throughout the information technology equipment area
- (2) Below the raised floor of the information technology equipment area containing cables
- (3) Above the suspended ceiling and below the raised floor in the information technology equipment area where these spaces are used to recirculate air to other parts of the building

**8.2.2** Where interlock and shutdown devices are provided, the electrical power to the interlocks and shutdown devices shall be supervised by the fire alarm control panel.

**8.2.3** The alarms and trouble signals of automatic detection or extinguishing systems shall be arranged to annunciate at a constantly attended location.

### **8.3 Portable Extinguishers and Hose Lines.**

**8.3.1** Listed portable fire extinguishers of the carbon dioxide type or a halogenated agent type shall be provided for the protection of electronic equipment. The extinguishers shall be maintained in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*.

**8.3.2\*** Listed extinguishers with a minimum rating of 2-A shall be provided for use on fires in ordinary combustible materials, such as paper and plastics. Dry chemical extinguishers shall not be permitted.

**8.3.3** A sign shall be located adjacent to each portable extinguisher and shall plainly indicate the type of fire for which it is intended.

**8.3.4** Where inside hose is provided, the hose shall be 3.81 cm (1½ in.) rubber-lined hose with shutoff and combination solid-stream and water-spray nozzles. It shall be installed and maintained in accordance with NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*. Inside hose supplied from a sprinkler system in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, shall be permitted.

**8.3.5** Where carbon dioxide hand hose lines are provided, the lines shall be installed and maintained in accordance with NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*.

### **8.4 Gaseous Total Flooding Extinguishing Systems.**

**8.4.1\*** Where there is a critical need to protect data in process, reduce equipment damage, and facilitate return to service, consideration shall be

Copyright NFPA

given to the use of a gaseous agent inside units or total flooding systems in sprinklered or nonsprinklered information technology equipment areas.

**8.4.2** Where gaseous agent or inert gas agent total flooding systems are used, they shall be designed, installed, and maintained in accordance with the requirements of NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems*; NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*; or NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*. The agent selected shall not cause damage to the information technology equipment and media. (See Annex D.)

**8.4.2.1** The power to all electronic equipment shall be disconnected upon activation of a gaseous agent total flooding system, unless the risk considerations outlined in Chapter 4 indicate the need for continuous power.

**8.4.3\*** Gaseous agent systems shall be automatically actuated by an approved method of detection meeting the requirements of *NFPA 72, National Fire Alarm Code*, and a listed releasing device compatible with the system.

**8.4.4\*** Where operation of the air-handling system would exhaust the agent supply, it shall be interlocked to shut down when the extinguishing system is actuated.

**8.4.5\*** Alarms shall be provided to give positive warning of a pending discharge and an actual discharge.

## **8.5 Warning Signs.**

Where continuous power is provided, signs shall be posted at each perimeter entrance to the information technology equipment areas warning that electrical equipment will remain energized, either upon activation of the suppression system or disconnect of main electrical service.

## **8.6 Training.**

Designated information technology equipment area personnel shall be continually and thoroughly trained in the functioning of the alarm system, desired response to alarm conditions, location of all emergency equipment and tools, and use of all available extinguishing equipment. This training shall encompass both the capabilities and the limitations of each available type of extinguisher and the proper operating procedures of the extinguishing systems.

## **8.7 Expansion or Renovations.**

**8.7.1** Whenever changes are made to the information technology equipment area ? for example, size, installation of new partitions, modification of the air-handling systems, or revised information technology equipment layout ? the potential impact on existing fire detection and extinguishing systems shall be evaluated and corrective changes shall be made if necessary.

**8.7.2** Modifications or alterations as outlined in 8.7.1 shall be submitted to the AHJ for approval.

## **Chapter 9 Records Kept or Stored in Information Technology Equipment Rooms**

### **9.1\* Protection Required for Records Within the Information Technology Equipment Room.**

Any records regularly kept or stored in the information technology equipment room shall be provided with the following protection:

- (1) Vital or important records that have not been duplicated shall be stored in listed record protection equipment with a Class 150 1-hour or better fire resistance rating as outlined in UL 72, *Standard for Tests for Fire Resistance of Record Protection Equipment*.
- (2) All other records shall be stored in closed metal files or cabinets.

### **9.2 Records Stored Outside the Information Technology Equipment Room.**

**9.2.1\*** All vital and important records shall be duplicated. Duplicated records shall be stored in a remote location that would not be exposed to a fire involving the original records. Records shall be stored in fire-resistive rooms in accordance with NFPA 232, *Standard for the Protection of Records*.

**9.2.2** Portable extinguishing equipment and hose lines for record storage rooms or areas shall be installed in accordance with 8.3.1 through 8.3.5.

## **Chapter 10 Utilities**

### **10.1 Heating, Ventilating, and Air Conditioning (HVAC).**

Any HVAC system that serves other occupancies shall also be permitted to serve the information technology equipment area.

**10.1.1** Dampers in HVAC systems serving information technology equipment areas shall operate upon activation of smoke detectors and by operation of the disconnecting means required by 10.4.8. The automatic fire and smoke dampers required by 5.5.3 shall also operate upon activation of smoke detectors and by operation of disconnecting means required by 10.4.8.

**10.1.2** Either air ducts serving other rooms shall not pass through the information technology equipment area or fire dampers shall be provided in the ducts.

**10.1.3** All duct insulation and linings, including vapor barriers and coatings, shall have a flame spread index of 25 or less without evidence of continued progressive combustion and a smoke developed index no higher than 50, in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*; ASTM E 84, *Standard Test Method for Surface Burning Characteristics of Building Materials*; or UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*.

**10.1.4\*** Air filters for use in air-conditioning systems shall have a Class 1 rating in accordance with UL 900, *Standard for Air Filter Units*.

## **10.2 Coolant Systems.**

If a separate coolant system is required for operation of an information technology equipment installation, it shall be provided with an approved alarm to indicate loss of fluid.

## **10.3\* Electrical Service.**

This section covers equipment, power-supply wiring, equipment interconnecting wiring, and grounding of information technology equipment and systems, including terminal units, in an information technology equipment room. [70:645.1]

**10.3.1** All wiring shall conform to *NFPA 70, National Electrical Code*. Wiring in an air space below a raised floor or above a suspended ceiling shall conform to Article 645 of NFPA 70 where such space is used to circulate information technology equipment area environmental air.

**10.3.2\*** Premise transformers installed in the information technology equipment area shall be of the dry type or type filled with a noncombustible dielectric medium. Such transformers shall be installed in accordance with the requirements of *NFPA 70, National Electrical Code*.

**10.3.3** Service entrance transformers shall not be permitted in the electronic information technology equipment area.

**10.3.4\*** Protection against lightning surges shall be provided in accordance with the requirements of *NFPA 70, National Electrical Code*.

**10.3.5\*** Junction boxes shall be approved, completely enclosed, fastened, accessible, and grounded. No splices or connections shall be made in the underfloor area except within junction boxes or approved-type receptacles and connectors.

**10.3.6** Emergency lighting shall be provided in the information technology equipment area.

#### **10.4 Supply Circuits and Interconnecting Cables.**

[70:645.5]

**10.4.1 Branch-Circuit Conductors.** The branch-circuit conductors supplying one or more units of a data processing system shall have an ampacity not less than 125 percent of the total connected load. [70:645.5(A)]

**10.4.2 Cord-and-Plug Connections.** The data processing system shall be permitted to be connected to a branch circuit by any of the following listed means:

- (1) Flexible cord and attachment plug cap not to exceed 4.5 m (15 ft).
- (2) Cord set assembly, where run on the surface of the floor, shall be protected against physical damage.  
[70:645.5(B)]

**10.4.3\* Interconnecting Cables.** Separate data processing units shall be permitted to be interconnected by means of listed cables and cable assemblies. Where exposed to physical damage, the installation shall be protected by approved means. [70:645.5(C)]

**10.4.4\* Under Raised Floors.** Power cables, communications cables, connecting cables, interconnecting cables, cord-and-plug connections, and receptacles associated with the information technology equipment shall be permitted under a raised floor, provided the following conditions are met:

- (1) The raised floor is of suitable construction, and the area under the floor is accessible.
- (2) The branch-circuit supply conductors to receptacles or field-wired equipment are in rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, electrical metallic tubing, electrical nonmetallic tubing, metal wireway, nonmetallic wireway, surface metal raceway with metal cover, nonmetallic surface raceway, flexible metal conduit, liquidtight flexible metal conduit, or liquidtight flexible



nonmetallic conduit, Type MI cable, Type MC cable, or Type AC cable. These supply conductors shall be installed in accordance with the requirements of *NFPA 70, National Electrical Code*, Section 300.11.

- (3) Supply cords of listed information technology equipment in accordance with *NFPA 70, National Electrical Code*, 645.5(B).
  - (4) Ventilation in the underfloor area is used for the information technology equipment room only, except as provided in *NFPA 70, National Electrical Code*, 645.4(2). The ventilation system shall be so arranged, with approved smoke detection devices, that upon the detection of fire or products of combustion in the underfloor space, the circulation of air will cease.
  - (5) Openings in raised floors for cords and cables protect cords and cables against abrasions and minimize the entrance of debris beneath the floor.
  - (6) Cables, other than those covered in (2) and those complying with (a), (b), and (c), shall be listed as Type DP cable having adequate fire-resistant characteristics suitable for use under raised floors of an information technology equipment room.
    - (a) Interconnecting cables enclosed in a raceway.
    - (b) Interconnecting cables listed with equipment manufactured prior to July 1, 1994, being installed with that equipment.
    - (c) Cable type designations Type TC (NFPA 70, Article 336); Types CL2, CL3, and PLTC (NFPA 70, Article 725); Type ITC (NFPA 70, Article 727); Types NPLF and FPL (NFPA 70, Article 760); Types OFC and OFN (NFPA 70, Article 770); Types CM and MP (NFPA 70, Article 800); and Type CATV (NFPA 70, Article 820). These designations shall be permitted to have an additional letter P or R or G. Green, or green with one or more yellow stripes, insulated single-conductor cables, 4 AWG and larger, marked 掣 or use in cable trays? or 掣 or CT use? shall be permitted for equipment grounding.
- [70:645.5(D)]

**10.4.5\* Abandoned Supply Circuits and Interconnecting Cables.** The accessible portion of abandoned supply circuits and interconnecting cables shall be removed unless contained in a metal raceway. [70:645.5(F)]

**10.4.6 Securing in Place.** Power cables; communications cables; connecting cables; interconnecting cables; and associated boxes, connectors, plugs, and receptacles that are listed as part of, or for, information technology equipment shall not be required to be secured in place. [70:645.5(E)]

**10.4.7\* Cables Not in Information Technology Equipment Room.** Cables extending beyond the information technology equipment room

Copyright NFPA

shall be subject to the applicable requirements of *NFPA 70, National Electrical Code*. [70:645.6]

**10.4.8 Disconnecting Means.** An approved means shall be provided to disconnect power to all electronic equipment in the information technology equipment room or in designated zones within the room. There shall also be a similar approved means to disconnect the power to all dedicated HVAC systems serving the room or designated zones and shall cause all required fire/smoke dampers to close. The control for these disconnecting means shall be grouped and identified and shall be readily accessible at the principal exit doors. A single means to control both the electronic equipment and HVAC systems in the room or in a zone shall be permitted. Where a pushbutton is used as a means to disconnect power, pushing the button in shall disconnect the power. Where multiple zones are created, each zone shall have an approved means to confine fire or products of combustion to within the zone.

*Exception: Installations qualifying under the provisions of NFPA 70, National Electrical Code, Article 685.* [70:645.10]

**10.4.8.1** Installations qualifying under the provisions of *NFPA 70, National Electrical Code*, Article 685, shall be permitted.

**10.4.9 Uninterruptible Power Supplies (UPS).** Except for installations and constructions covered in 10.4.9(1) or 10.4.9(2), UPS systems installed within the information technology room, and their supply and output circuits, shall comply with 10.4.8. The disconnecting means shall also disconnect the battery from its load.

- (1) Installations qualifying under the provisions of *NFPA 70, National Electrical Code*, Article 685
- (2) Power sources limited to 750 volt-amperes or less derived either from UPS equipment or from battery circuits integral to electronic equipment [70:645.11]

**10.4.9.1\*** Storage battery systems in the information technology equipment area shall comply with the requirements of *NFPA 70, National Electrical Code*, Article 480.

**10.4.10\* Grounding.** All exposed non-current-carrying metal parts of an information technology system shall be bonded to the equipment grounding conductor in accordance with *NFPA 70, National Electrical Code*, Article 250, or shall be double insulated. Power systems derived within listed information technology equipment that supply information technology systems through receptacles or cable assemblies supplied as part of this equipment shall not be considered separately derived for the purpose of applying *NFPA 70*, Section 250.20(D). Where signal reference structures are installed, they shall be bonded to the equipment grounding conductor provided for the information technology equipment. [70:645.15]

**10.4.11 Marking.** Each unit of an information technology system supplied by a branch circuit shall be provided with a manufacturer's nameplate, which shall also include the input power requirements for voltage, frequency, and maximum rated load in amperes. [70:645.16]

## Chapter 11 Emergency and Recovery Procedures

### 11.1\* Emergency Fire Plan.

There shall be a management-approved written, dated, and annually tested emergency fire plan.

#### 11.1.1 Fire Safety of Fire Fighters.

**11.1.1.1 Fire Department Information.** Where requested by the local fire department, the following shall be provided:

- (1) A general description of the information technology equipment within the building and how it is powered
- (2) An up-to-date floor plan of all information technology equipment and information technology equipment areas
- (3) Actions to be taken concerning ventilation and the prevention of contamination of areas not affected by the fire

**11.1.1.2\* Fire Service Orientation and Information.** When requested by the local fire department, orientation and information shall be provided to the fire personnel by the company management as follows:

- (1) A general description of the facilities and all the information technology equipment
- (2) An orientation walkthrough of the facility to address all the orientation and information issues to ensure life safety and service continuity are upheld
- (3) The strategy and tactics to confine, suppress, and limit an incident's impact in the information technology equipment area

### 11.2\* Damage Control Plan.

There shall be a management-approved written, dated, and annually tested damage control plan.

### 11.3\* Recovery Procedures Plan.

There shall be a management-approved written, dated, and annually tested plan covering recovery procedures for continued operations.

## Annex A Explanatory Material

*Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.*

**A.1.2** This standard does not cover installation of information technology equipment and information technology equipment areas that can be made without special construction or protection. It can, however, be used as a management guide for the installation of electrically powered mechanical information technology equipment, small tabletop or desk-type units, and information technology equipment.

The strategic importance placed on information technology equipment and areas by the user is vitally tied to uninterrupted operation of the system. Consequently, by the partial or entire loss of this equipment, an entire operation of vital nature could be temporarily paralyzed.

Not to be overlooked are the one-of-a-kind information technology systems. These are the custom-made models that are designed to perform specific tasks. Replacement units for this type of equipment are not available, and the probability of the existence of duplicate facilities, which could be used to perform vital operations in the event that the one-of-a-kind systems are partially or totally impaired by a fire, is remote.

**A.3.2.1 Approved.** The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

**A.3.2.2 Authority Having Jurisdiction (AHJ).** The phrase 权威 having jurisdiction, or its acronym AHJ, is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention

bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

**A.3.2.4 Listed.** The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

**A.3.3.13 Raised Floor.** Sometimes referred to as a false floor, secondary floor, or access floor.

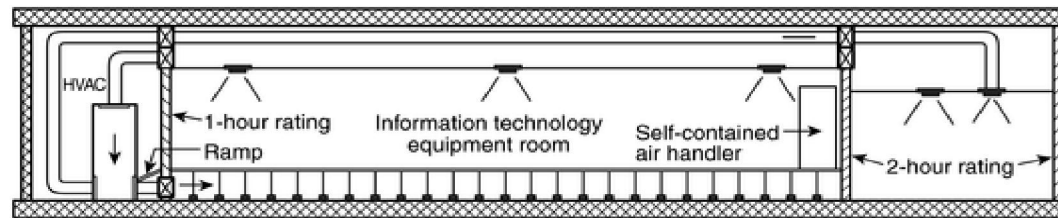
**A.5.1** The structural floor supporting the information technology equipment area should have sufficient floor loading capacity to sustain the expected floor load.

**A.5.1.2** NFPA 80A, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures*, details one method of providing exposure protection.

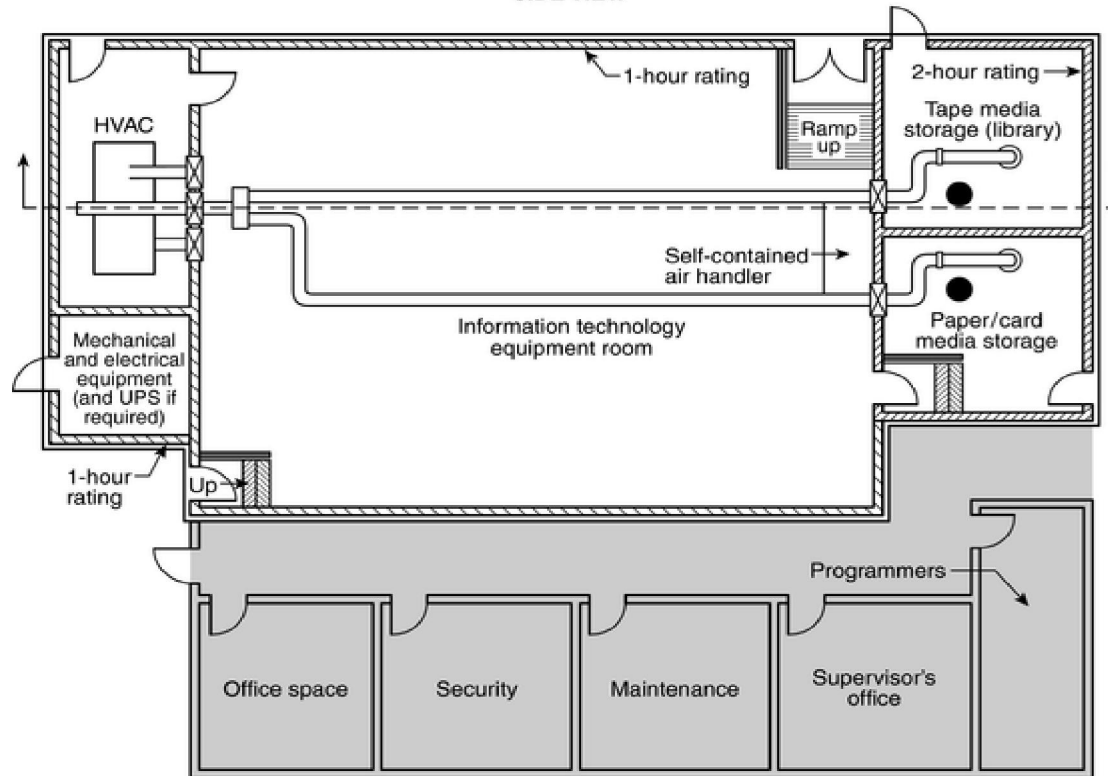
**A.5.1.3** Experience with fires affecting information technology equipment rooms has demonstrated that the fire often starts in areas other than the information technology equipment area and that the fire and its related products, including smoke, soot, and heat, can enter the information technology equipment room if it is not adequately separated by sealed, rated walls. Consideration should be given to raising the rating of perimeter walls to 2 hours where adjacent walls are already rated 2 hours or greater.

The prudent facilities manager would do well to limit the exposure fire hazard by locating an information technology equipment facility in a fully sprinklered building.

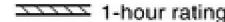


The rooms shown in Figure A.5.1.3 are symbolic and do not denote size, shape, or location, nor are the rooms in Figure A.5.1.3 necessarily required in the information technology equipment area. The information technology equipment area includes only those support rooms served by the same special air-conditioning/air-handling equipment as the information technology equipment room. Information technology equipment rooms normally have a raised floor.



**SIDE VIEW**



**TOP VIEW**

 1-hour rating
  2-hour rating
  Fire/smoke damper

### **FIGURE A.5.1.3 Diagram of Information Technology Equipment Area.**

**A.5.2** Steam, water, or horizontal drain piping should not be in the space above the suspended ceiling and over information technology equipment other than for sprinkler system use.

The information technology equipment area should be located to minimize exposure to fire, water, corrosive fumes, heat, and smoke from adjoining areas and activities.

Basement areas should not be considered for the location of an information technology equipment area. If information technology equipment is located in a basement, precautions should be taken to facilitate smoke venting and to prevent flooding from interior and exterior sources that can occur, including a fire on an upper floor.

Many information technology equipment installations have become prime targets for sabotage and arson. The location and construction should be designed to minimize the possibility of penetration by an explosive or incendiary device. It is essential that access be restricted to only those persons absolutely necessary to the operation of the equipment. A controlled-access system of admittance through positive identification should be maintained at all times.

**A.5.3.2** In multistoried buildings, the floor above the information technology equipment room should be made reasonably watertight to avoid water damage to equipment. Any openings, including those for beams and pipes, should be sealed to watertightness. Where drainage is installed in an area containing an underfloor extinguishing system, provisions should be made for maintaining the drain piping as a closed system unless water is present. These provisions are required to ensure the integrity of a gaseous extinguishing system and allow for maintenance of the necessary concentration level. Because water will evaporate from the standard plumbing trap, mineral oil or another substitute should be considered.

Underfloor spaces should be provided with a leak detection system where any utility or computer auxiliary cooling fluids are piped into the information technology equipment room or are capable of entering the room from adjoining areas. The system should be capable of generating a silenceable supervisory signal upon sensor contact with water. The system should continuously supervise all sensors and interconnecting components for electrical continuity. It should also include a self-test capability.

**A.5.4** The determination of the depth of the raised floor should take into consideration air movement and fire detection and extinguishing systems requirements (if installed), as well as building construction restrictions.

**A.5.4.4** Openings in raised floors for electric cables or other uses should be protected to minimize the entrance of debris or other combustibles.

**A.6.1.1** Support equipment, such as high-speed printers, that utilize large quantities of combustible materials should be located outside the information technology equipment room whenever possible.

**A.7.1.2** All nonelectrical parts, such as housings, frames, supporting members, and so forth, should not constitute additional fire hazards to the equipment.

**A.7.1.4** See NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*.

**A.8.1.1.2** The use of carbon dioxide systems for the protection of spaces beneath raised floors is discussed in Section B.5 of NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*, wherein it is pointed out that the design of such systems requires compensation for leakage and provision for a soft discharge to minimize turbulence and agent loss through perforated tiles. These same concerns exist for other inert gas clean agent systems installed in accordance with NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*. Since these spaces are usually of a very limited height, this type of fire suppression system might be easier to design and install than sprinklers.

The use of halocarbon agents for protection of the spaces under a raised floor where the room is not simultaneously protected is not recommended. However, where a room is protected by a halocarbon system, the space beneath its raised floor needs to be included in the system coverage.

**A.8.1.2** In facilities that are under the supervision of an operator or other person familiar with the equipment, during all periods that equipment is energized, the normal delay between the initial outbreak of a fire and the operation of a sprinkler system will provide adequate time for operators to shut down the power by use of the emergency shutdown switches as prescribed in Section 10.4. In other instances where a fire can operate sprinkler heads before discovery by personnel, a method of automatic detection should be provided to automatically de-energize the electronic equipment as quickly as possible.

To minimize damage to electronic computer equipment located in sprinkler-protected areas, it is important that power be off prior to the application of water on the fire.

**A.8.1.4** It is not intended that small automatic media loaders or AISS units be provided with protection within the unit. The decision of whether to install protection within the unit should be based on the combustible load being added to the room or area. In the absence of further information, it is reasonable to assume that units that handle in the range of 0.76 m<sup>3</sup> (27 ft<sup>3</sup>) of combustible storage space or less need not be



provided with protection within the unit. The 0.76 m<sup>3</sup> (27 ft<sup>3</sup>) volume assumes that no single dimension is larger than 0.9 m (3 ft) [for example, 0.9 m × 0.9 m × 0.9 m (3 ft × 3 ft × 3 ft)].

**A.8.2** Fire detection and extinguishing systems should be selected after a complete evaluation of the exposures. The amount of protection provided should be related to the building construction and contents, equipment construction, business interruption, exposure, and security need. For amplification of the important need of fire protection, see Chapter 4.

**A.8.2.1** The detection system selection process should evaluate the ambient environmental conditions in determining the appropriate device, location, and sensitivity. In high airflow environments, air-sampling detection devices should be considered.

**A.8.3.2** For more information, see NFPA 10, *Standard for Portable Fire Extinguishers*.

**A.8.4.1** If major concerns over potential fire loss of specific critical data or equipment or serious interruption to operations cannot be resolved or alleviated by equipment redundancy, subdivision of the information technology equipment area, or use of leased facilities, automatic gaseous agent total flooding might be the only feasible approach to handling an incipient fire situation with an acceptable minimum amount of damage. At the same time, this sophisticated protection approach requires that all environmental design criteria ? for example, damper closure, fan shutdown, and sealed openings ? be carefully maintained to ensure that the needed concentration for extinguishment will be achieved.

**A.8.4.3** The gaseous extinguishing system can be actuated by the automatic fire detection system required in Section 8.2 when designed to do so.

**A.8.4.4** This provision requires that all environmental design criteria ? for example, damper closure, fan shutdown, and sealed openings ? be carefully maintained to ensure that needed concentration for extinguishment will be achieved. It is preferable, but not essential, to de-energize information technology equipment prior to discharge if information technology equipment shutdown does not cause major service interruptions.

**A.8.4.5** Predischage and discharge alarms are provided to facilitate evacuation of all occupants if considered necessary.

**A.9.1** The protection of records storage with an extinguishing system does not reduce the need for duplicate records. In the event of a fire, some damage to the records can occur prior to operation of the extinguishing system.

The evaluation of records should be a joint effort of all parties concerned with the safeguarding of information technology equipment operations. The amount of protection provided for any record should be directly related to its importance in terms of the mission of the information technology equipment system and the reestablishment of operations after a fire. It is assumed that information technology equipment capable of

properly using the records will be available. (*See Chapter 11.*)

**A.9.2.1** The size of record storage rooms should be determined by an engineering evaluation of the operation and the application of sound fire protection engineering principles. The evaluation should include, but not be limited to, the following:

- (1) Classification of records
- (2) Quantity of plastic-based records and type of container
- (3) Type and capacity of fire suppression system
- (4) Venting available for removal of products of combustion
- (5) Type and arrangement of fire detection system
- (6) Building construction materials

**A.10.1.4** Electric reheat units can collect dust over a period of time. When heat is applied after several months of nonuse and a significant amount of dust and lint has accumulated on the heating elements, energizing of the elements can cause sufficient smoke particles to actuate a sensitive smoke detector in the smoke exhaust (air discharge) area. These reheat units should be set up with a weekly timer circuit to burn off the small amounts of dust that have collected to maintain these reheat units in a clean condition.

**A.10.3** The requirements in Section 10.3 apply to all power and service wiring supplying the information technology equipment. The requirements of Section 10.3 do not apply to wiring and components within the actual equipment or to wiring connecting various units of equipment. The equipment and interconnected wiring requirements are set forth in Chapter 7.

**A.10.3.2** It is recommended that premise transformers not be installed in the information technology equipment area.

**A.10.3.4** Besides providing protection against lightning surges as required in *NFPA 70, National Electrical Code*, it is recommended that the building housing an information technology equipment area be protected against lightning in accordance with *NFPA 780, Standard for the Installation of Lightning Protection Systems*.

**A.10.3.5** The number of junction boxes in underfloor areas should be kept to a minimum.

**A.10.4.3** Some interconnect cables that are part of listed information technology equipment do not carry a separate listing mark on the cables.

Such interconnect cables have been evaluated as part of the listed information technology equipment and are identified as being part of the listed equipment.

**A.10.4.4** One method of defining fire resistance is by establishing that the cables do not spread fire to the top of the tray in the Vertical Tray Flame Test? referenced in UL 1581, *Standard for Electrical Wires, Cables, and Flexible Cords*. Another method of defining fire resistance is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA Vertical Flame Test? Cables in Cable Trays,? as described in CSA C22.2 No. 0.3 96, *Test Methods for Electrical Wires and Cables*.

**A.10.4.5** Abandoned cable can interfere with airflow and extinguishing systems. Abandoned cable also adds to the fuel loading.

**A.10.4.7** For signaling circuits, refer to *NFPA 70, National Electrical Code*, Article 725; for optical fiber cables and raceways, refer to *NFPA 70*, Article 770; and for communications circuits, refer to *NFPA 70*, Article 800. For fire alarm systems, refer to *NFPA 70*, Article 760.

[70:645.6 FPN]

**A.10.4.9.1** The installation of certain storage battery systems can create a hydrogen gas generation concern, a fire load concern, and an acid spill hazard. For these installations, the design of the facilities to mitigate these hazards is appropriate.

**A.10.4.10** The bonding requirements in the product standards governing this listed equipment ensure that it complies with *NFPA 70, National Electrical Code*, Article 250. [70:645.15 FPN 1]

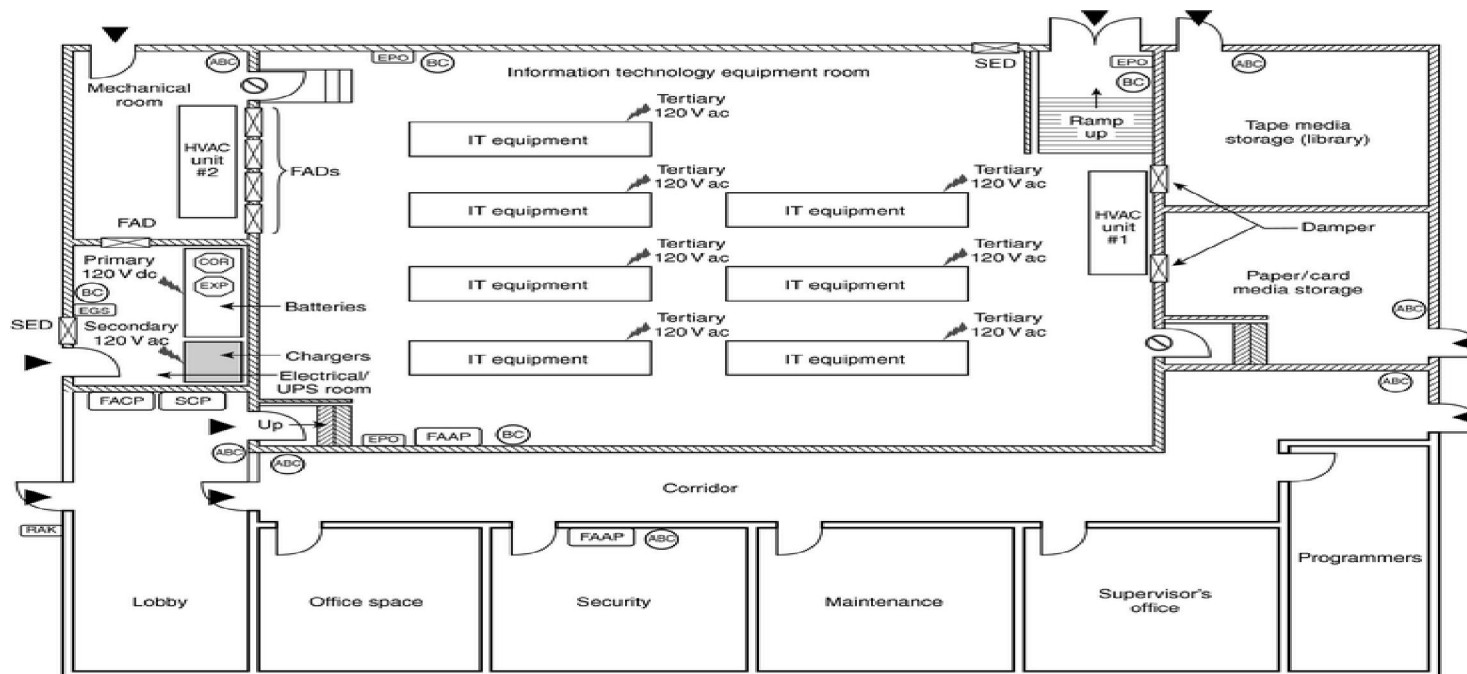
Where isolated grounding-type receptacles are used, see *NFPA 70*, 250.146(D) and 406.2(D). [70:645.15 FPN 2]

**A.11.1** A written emergency fire plan should be prepared for and posted at each installation that assigns specific responsibilities to designated personnel. This plan should be coordinated with all responding emergency agencies. Personnel should receive continuing instructions in at least the following:

- (1) The method of turning off all electrical power to the following:
  - (a) The information technology equipment under both normal and emergency conditions
  - (b) The air-conditioning systems serving the area
- (2) Alerting the fire department or fire brigade

- (3) Evacuation of personnel and designated assembly area
- (4) The operations of all fire-extinguishing and damage control equipment, including automatic detection equipment
- (5) The use of extinguishers through actual operation on a practice fire
- (6) Control of hazardous materials

**A.11.1.1.2** Fire service orientation and information might include the review of the information technology equipment placement, depowering issues, and how to perform depowering. Additionally, it might be in the best interest of the facility manager to initiate the fire service orientation. Figure A.11.1.1.2 is an example of a pre-fire plan drawing.



Note: Drawing is intended to convey some of the items that should be documented as part of the pre-fire plan. It is not intended to demonstrate good design practice nor compliance with any code or standard.

#### LEGEND

Symbol	Description	Symbol	Description
	Fire alarm control panel		Emergency generator shutoff switch
	Fire alarm annunciator panel		Type ABC portable fire extinguisher
	Smoke control panel		Type BC portable fire extinguisher
	Fire fighter access		Damper
	No fire fighter access—contamination hazard		Smoke exhaust damper
	Power supply and voltage		Fresh air damper
	Corrosive material		Rapid access keyboard
	Explosive gas potential		1-hour rating
	Equipment containing PCBs		2-hour rating
	IT and HVAC equipment emergency power off switch		

#### **FIGURE A.11.1.1.2 Pre-Fire Plan Drawing.**

**A.11.2** A damage control plan should provide a means for at least the following:

- (1) Preventing or minimizing damage to electronic equipment
- (2) Preventing or minimizing damage to operations and other equipment

For example, whenever electronic equipment or any type of record is wet, smoke damaged, or otherwise affected by the results of a fire or other emergency, it is vital that immediate action be taken to clean and dry the electronic equipment. If water, smoke, or other contamination is permitted to remain in the equipment longer than absolutely necessary, the damage can be grossly increased.

In addition, a means should be provided for preventing water damage to electronic equipment. The proper method of doing this will vary according to the individual equipment design. Consideration should be given to the provision of waterproof covers, which should be stored in easily accessible locations.

**A.11.3** Emergency procedures for the continued operation of an information technology equipment system should include, but not be limited to, the following:

- (1) A program to protect records in accordance with their importance as set forth by Chapter 9
- (2) An analysis of the workload and its effect on continuity of operations
- (3) A written set of requirements for the backup site, including the following:
  - (a) Backup files and equipment required
  - (b) Configuration of mainframe computer and peripheral units
  - (c) Alternative locations for backup processing
  - (d) Availability of backup system
  - (e) Telecommunications required at backup site
  - (f) Files, input work, special forms, and so forth, needed

- (g) Personnel staffing and transportation
- (h) Agreements and procedures for the emergency use of information technology equipment at a contingency site

## **Annex B What to Do in the First 24 Hours for Damaged Electronic Equipment and Magnetic Media**

*This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.*

### **B.1**

The following material is extracted from the BMS Cat publication 掏 letronics & Magnetic Media Recovery.?

### **B.2**

This plan attempts to detail the necessary recovery steps to be taken after a disaster has occurred to electronic equipment. The plan considers fire, heat, smoke, and water damage and is designed to limit and mitigate potential losses. The equipment under discussion includes office computers, word processors, telephone switching equipment, test equipment, audio-video equipment, and other electrical and electronic apparatus.

**WARNING:** *It is most important that power be disconnected from all wet and smoke contaminated electronic equipment immediately. Not only is there a continuing danger from electrical shorts to the equipment, but voltage potential within the circuitry tends to plate contaminants onto printed circuit boards and backplanes.*

### **B.3 Smoke Damage.**

Primary damage to electronic equipment is caused by smoke that contains corrosive chloride and sulfur combustion by-products. Smoke exposure during the fire for a relatively short period of time does little immediate damage. However, the particulate residue left after the smoke has dissipated contains the active by-product that will corrode metal contact surfaces in the presence of moisture and oxygen.

The ultimate objective in restoration is the removal of the contaminant. Since all of the equipment cannot be cleaned simultaneously, it is most important that immediate steps be taken to arrest the corrosion process.

- (1) Move the exposed equipment into an air-conditioned and humidity controlled environment as soon as possible (40? 0 percent relative

Copyright NFPA

humidity will generally prevent an acceleration of corrosive activity).

- (2) If moving the equipment is not possible, make sure the equipment area is sealed off from outside elements. (Caution: do not wrap the individual pieces of equipment in any material that tends to trap moisture inside the chassis.)
- (3) Spray connectors, backplanes and printed circuit board surfaces with Freon or Freon-alcohol solvents for preliminary cleanup.
- (4) Follow up with any corrosion inhibiting aerosol spray to stabilize metal contact surfaces. This will leave a thin but easily removable coating helping to prevent oxygen and moisture from activating the corrosion process.

Once the corrosion process is stabilized, an analysis can be made of the contaminants, and appropriate decontamination processes can be applied.

#### **B.4 Water Damage.**

It is a popular misconception that electronic equipment exposed to water and moisture is permanently damaged. Water that is sprayed, splashed, or dripped onto electronic equipment can be easily removed. Even equipment that has been totally submerged can be restored. However, in every case of water damage, immediate countermeasures are imperative. It is most important to turn off all electrical power to the equipment; i.e., DO NOT ENERGIZE ANY WET EQUIPMENT.

- (1) Open cabinet doors, remove side panels and covers, and pull out chassis drawers to allow water to run out of equipment.
- (2) Set up fans to move room temperature air through the equipment for general drying. Move portable equipment to dry air conditioned areas.
- (3) Use compressed air at no higher than 50 psi to blow out trapped water.
- (4) Use hand-held dryers on lowest setting to dry connectors, backplane wirewraps, and printed circuit cards. (Caution: Keep the dryer well away from components and wires. Overheating of electronic parts can cause permanent damage.)
- (5) Use cotton-tipped swabs for hard-to-reach places. Lightly dab the surfaces to remove residual moisture. Do not use cotton tipped swabs on wirewrap terminals.
- (6) Water displacement aerosol sprays containing Freon-alcohol mixtures are effective in first step drying of critical components.
- (7) Follow up with professional restoration as soon as possible.



## B.5 Tape/Disk Drive.

The most important asset to be preserved following the loss is the corporate media (company database).

Severe damage to disk read/write heads and tape transport mechanisms is probable if an attempt is made to operate with media that is not clean. A head-crash? caused by particulate on the surface of a disk will not only damage the drive but result in a loss of data. Dirty tapes will stick and break causing loss of data. Emergency one-time cleaning of contaminated tapes and disks, for data recovery, is possible. The damaged media is then discarded after data recovery.

First step emergency procedures are:

- (1) Place all contaminated magnetic media in air conditioned area to remove water and stabilize media surfaces.
- (2) Remove media from wet and contaminated containers where possible. Identify all media as to type, application, and location.
- (3) Wipe exterior surfaces with alcohol or Freon-alcohol solutions to remove contamination.
- (4) Data recovery from contaminated floppy disks, tapes, hard disks, and all associated drive and read/record equipment.

## Annex C Risk Considerations, Business Interruption, and Temperature Considerations

*This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.*

### C.1 Risk Considerations.

**C.1.1** Information technology equipment is a vital and commonplace tool for business, industry, government, and research groups. The use of such equipment is a direct result of the increased complexity of modern business, industrial, governmental, and research needs. Particularly pertinent are the increasing number of variables that must be taken into consideration in everyday decisions ? overlooking any one item can spell the difference between profit and loss, success and failure, and life and death. To keep track of all these variables, information technology equipment offers practical answers.

**C.1.2** Information technology equipment has become the accepted tool to process large amounts of statistical, problematical, or experimental

information and to print out or display answers or information in very short periods of time. Reliance is placed on the equipment to perform the repetitive, the experimental, and, in some cases, even the whole programming operation for business, industry, government, and research groups.

**C.1.3** Risk considerations include the selection of proper equipment, preparation of areas to receive the equipment, requirements for utilities, orientation and training of personnel to operate the equipment, as well as consideration for expansion of the initial facility. One other factor should be included in this vital study, namely, protection against fires of either accidental or deliberate origin, such as sabotage and incendiary.

**C.1.4** Information technology equipment and materials for data recording and storage can incur damage where exposed to sustained elevated ambient temperatures. The degree of such damage will vary depending upon the exposure, equipment design, and composition of materials for data recording and storage.

## **C.2 Business Interruption.**

Business interruption is 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.

## **C.3 Temperature Considerations.**

The following are guidelines concerning sustained high ambient temperatures.

- (1) Damage to functioning information technology equipment can begin at a sustained ambient temperature of 79.4癈 (175癈 ), with the degree of damage increasing with further elevations of the ambient temperature and exposure time.
- (2) Damage to magnetic tapes, flexible discs, and similar media can begin at sustained ambient temperatures above 37.8癈 (100癈 ). Damages occurring between 37.8癈 (100癈 ) and 48.9癈 (120癈 ) can generally be reconditioned successfully, whereas the chance of successful reconditioning lessens rapidly with elevations of sustained ambient temperatures above 48.9癈 (120癈 ).
- (3) Damage to disc media can begin at sustained ambient temperatures above 65.6癈 (150癈 ), with the degree of damage increasing rapidly with further elevations of sustained ambient temperatures.
- (4) Damage to paper products, including punched cards, can begin at a sustained ambient temperature of 176.7癈 (350癈 ). Paper products that have not become brittle will generally be salvageable.
- (5) Damage to microfilm can begin at a sustained ambient temperature of 107.2癈 (225癈 ) in the presence of steam or at 260癈 (500癈 )

in the absence of steam.

## Annex D General Guidance for Gaseous Agent Systems in Information Technology Equipment Spaces

*This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.*

### **D.1 Gaseous Agents.**

The use of gaseous agents provides the potential for automatic fire suppression in the incipient fire stage so that the information technology system can continue to perform its mission with little or no interruption. When coupled with a well-designed early warning detection system, the gas can be automatically released in the early stages of a fire scenario and, being three dimensional, it will penetrate all portions of the space protected, including internal volumes of key components of the system when they are ventilated from the room. Thus an operator does not have to be present or, if present, does not have to determine if and where the fire is occurring and how to deal with it.

Gaseous agents fall into the following two general categories: inert gases and chemical agents.

**D.1.1 Inert Gases.** Inert gases include gases that extinguish fires by reducing the oxygen level to a point where it will not support combustion. The inert gases found in NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*, generally consist of a single gas (nitrogen or argon), blends of gases (nitrogen and argon), or blends with carbon dioxide as a secondary component. See NFPA 2001 for specific agent and system design guidance.

Carbon dioxide also falls into the category of inert gases; however, at the concentration normally used for total flooding of protected spaces, the resulting environment is hazardous to personnel. The use of carbon dioxide systems is contained in NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*.

**D.1.2 Chemical Agents.** Chemical agents include gases that have been found to be effective in suppressing fires by chemical means or, in some cases, by a combination of chemical reaction and cooling. See NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*, for specific agent and system design guidance.

While these systems have proven to be effective and relatively trouble-free when installed as approved, it is prudent to consider the following

Copyright NFPA

factors in integrating such systems into a facility:

- (1) Effectiveness of agent on types of fires expected
- (2) Energized versus de-energized equipment
- (3) Possible effect of 推 eat? agent discharges on the equipment and/or space that is being protected
- (4) Dealing with products of combustion and/or products of decomposition created in a fire and fire suppression
- (5) Potential hazard to personnel
- (6) Long-term availability of agent and/or system components
- (7) Compatibility of system operation with facility operation
- (8) Selection of detection system

## **D.2 Effectiveness of Fire-Suppressing Agent.**

The effectiveness can vary depending on combustibles present and certain characteristics of the hazard protected. Systems are tested and listed or approved so they will afford protection of most hazards when the system is installed in accordance with the system manual. An owner should become familiar with the system design parameters as given in the manual. Certain combustibles can need higher concentrations than the standard combustibles used in the approval process. Refer to information giving recommended concentrations for specific materials.

Total flooding agents are effective when the gas envelops the protected equipment at the proper concentration, a minimum concentration is held until the ignition source is removed, and any smoldering fire that remains after flame extinguishment is controlled. This statement generally means that the enclosure to be flooded needs to be enclosed as much as possible to retain the gas discharged. Integrity of the space protected can need verification and means taken to close off openings to ensure an adequate gas concentration holding time.

The removal of an ignition source in an information technology equipment room generally means the shutting off of power. Continued application of electrical power to information technology equipment can result in ongoing electrical arcing or sustained high temperature 搵 ot spots? in equipment. Such arcing can decompose halogenated agents into toxic and corrosive by-products such as hydrochloric acid, hydrofluoric acid, and possibly carbonyl halides. High temperatures such as those present in flame or glowing metal surfaces also may

decompose halogenated agents into quantities of toxic and corrosive by-products. Although some decomposition of halogenated agents occurs in the process of extinguishing fire, the quantity of the toxic and corrosive by-products is limited if the following conditions exist:

- (1) The system is designed in accordance with applicable NFPA standards.
- (2) Continued arcing or hot spots in excess of the agent's thermal decomposition temperature are not present.

If electrical power is not to be shut down to the protected space upon discharge of a halogenated gaseous agent, operators, fire fighters, and the owner of the facility need to be aware of the possibility of increased quantities of toxic and corrosive by-products being generated by decomposition of the halogenated agent.

### **D.3 Agent Discharge.**

When the stored energy of compressed gases is released, high-velocity discharges can result. These discharges can move ceiling tiles, cause undue turbulence, and so forth. Proper system selection arrangement and design that minimizes these effects should be used.

The rapid introduction of gas can cause a pressure buildup in a confined space. This rapid pressure buildup can be a concern for well-sealed spaces, and venting might be needed. When released, some gases, especially carbon dioxide, will rapidly expand in a room or enclosure, causing significant cooling of air and small-mass material. Where significant cooling can be a problem, techniques to minimize this cooling should be employed.

### **D.4 Products of Combustion and Products of Extinguishing Agent Breakdown.**

In the course of fire suppression, products of combustion are created, and products formed as chemical agents break down during the fire-extinguishing process. These products can be toxic, noxious, and corrosive, so it is imperative that their creation be minimized. Decomposition products are kept to a minimum by the detection and suppression of fires while they are small, quick extinguishment of open burning, and elimination of all ignition sources. Systems that have been approved and installed according to the NFPA standards referenced have been shown to do this. Delaying suppression by having systems manually released or by aborting and delaying discharge can significantly raise the level of these products resulting from a fire. A method to purge these products after fire extinguishment is needed.

### **D.5 Hazard to Personnel.**

In normally occupied spaces, agents or agent concentration that can cause hazards to personnel require a predischage warning and evacuating

Copyright NFPA

system. In the event of a fire, all protected space should be evacuated as soon as possible.

#### **D.6 Halon 1301 Agent and System Availability.**

The production of halons has stopped in the industrialized world. However, even though no new gas is being produced, recycled gas is still available. An owner who wants to use a system with halon should have a plan to ensure future gas availability in case of a system discharge and the need for refill. See NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems*.

#### **D.7 Compatibility to Facility Operation.**

Gaseous systems work best where the power can be turned off to eliminate all electrical faults that could serve as a continuing ignition source. If a facility is arranged so that power cannot be shut off, then normal gaseous agent system designs can be inadequate. A higher gas concentration and the ability to hold that concentration long enough to allow operator intervention to isolate and eliminate the continuing ignition source are required.

Similarly, if a protected space does not have a dedicated air-conditioning system and ventilation of the protected space cannot be shut down, these conditions should be considered in the system design.

## **Annex E Informational References**

### **E.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.

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

NFPA 10, *Standard for Portable Fire Extinguishers*, 2007 edition.

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*, 2008 edition.

NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems*, 2009 edition.

Copyright NFPA

NFPA 70®, *National Electrical Code*®, 2008 edition.

NFPA 80A, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures*, 2007 edition.

NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, 2006 edition.

NFPA 780, *Standard for the Installation of Lightning Protection Systems*, 2008 edition.

NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*, 2008 edition.

### **E.1.2 Other Publications.**

**E.1.2.1 BMS Cat Electronics and Magnetic Media Recovery Services.** Blackmon-Mooring-Steamatic Catastrophe, Inc., International Headquarters, 303 Arthur Street, Fort Worth, TX 76107, (800)433-970.

Electronics & Magnetic Media Recovery, n.d.

**E.1.2.2 CSA Publications.** Canadian Standards Association, 5060 Spectrum Way, Mississauga, ON L4W 5N6, Canada.

CSA C22.2 No. 0.3 96, *Test Methods for Electrical Wires and Cables*, 1996.

**E.1.2.3 UL Publications.** Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 1581, *Standard for Electrical Wires, Cables, and Flexible Cords*, 2001 including revisions through May 6, 2003.

### **E.2 Informational References. (Reserved)**

### **E.3 References for Extracts in Informational Sections.**

NFPA 70®, *National Electrical Code*®, 2008 edition.

## **Index**

Access panels, floor .....	5.4.3
Acoustical materials .....	7.2.3
Air ducts .....	5.5.3, 10.1.2, 10.1.3
Air filters	
HVAC systems .....	10.1.4, A.10.1.4
Information technology equipment .....	7.2.1
Airflow .....	10.3.1, A.8.2.1, A.10.4.5
	A.5.1.3; <i>see also</i> Air ducts; Heating, ventilating, and air conditioning
Air-handling systems .....	(HVAC) systems
Fan shutdown .....	A.8.4.1, A.8.4.4
Gaseous extinguishing systems, use of .....	8.4.4, A.8.4.4

Copyright NFPA



Under raised floors .....	10.4.4(4)
Renovation of system .....	8.7.1
Air-sampling detection devices .....	A.8.2.1
Air spaces .....	5.6, 10.3.1
Definition .....	3.3.1
Alarms	
Cables for .....	A.10.4.7
Detection systems .....	8.2.2, 8.2.3
Gaseous extinguishing systems .....	8.4.5, A.8.4.5
Training for .....	8.6
Application of standard .....	1.3
Approved (definition) .....	3.2.1, A.3.2.1
Authority having jurisdiction (definition) .....	3.2.2, A.3.2.2
Automated Information Storage System (AISS) .....	6.2.1.2, 8.1.4, A.8.1.4
Definition .....	3.3.2

Boxes, junction .....10.3.5, A.10.3.5

Branch-circuit conductors .....10.4.1, 10.4.4(2)

Branch circuits .....10.4.2

Business interruption .....4.1, 4.2, A.1.2, C.2

    Definition .....3.3.3

## Cables

Abandoned .....	10.4.5, A.10.4.5
Connecting .....	10.4.2, 10.4.4, A.10.4.4
Interconnecting .....	see Interconnecting cables
Not in information technology area .....	10.4.7, A.10.4.7
Openings for .....	5.4.4, 5.5.1, 10.4.4(5), A.5.4.4
Securing in place .....	10.4.6
Under raised floors .....	10.4.4, A.10.4.4
Carbon dioxide extinguishing systems .....	8.1.1.2, A.8.1.1.2, D.1.1

## Ceilings

Detection system in .....	8.2.1, A.8.2.1
---------------------------	----------------

Copyright NFPA

Wiring in air space .....	5.6, 10.3.1
Cellular plastics .....	5.3.1.3
Chemical agents .....	D.1.2
Circuits, supply .....	10.4, A.10.4.3, A.10.4.4
Console (definition) .....	3.3.4
Construction .....	Chap. 5; <i>see also</i> Fire-resistant-rated construction
Air space .....	5.6
Building construction .....	5.1, A.5.1
Information technology equipment .....	Chap. 7
Interior construction materials .....	5.3, A.5.3.2
Penetrations of fire-resistant-rated enclosures .....	5.5
Raised floors .....	5.4, A.5.4
Continuous power supply .....	8.5
Coolant systems, information technology equipment installation .....	10.2
Cord-and-plug connections .....	10.4.2

Damage control .....	11.2, A.8.1.2, A.11.1, A.11.2, Annex B
Dampers, fire and smoke .....	5.5.3, 10.1.1, A.8.4.1, A.8.4.4
Data processing systems .....	<i>see</i> Information technology equipment
Decking, raised floor .....	5.4.2
Detection systems .....	8.7.1, A.11.1
De-energizing of equipment by .....	8.5, A.8.1.2
Gaseous extinguishing systems .....	8.4.3, A.8.4.3, D.1
Installation .....	8.2, A.8.2
Detectors	
Air-sampling .....	A.8.2.1
Heat (definition) .....	3.3.5.1

Copyright NFPA

Smoke .....	8.2, 10.1.1, A.8.2, A.10.1.4
Definition .....	3.3.5.2
Disconnecting means .....	10.4.8
Disk media	
High temperature damage .....	C.3(3)
Recovery of .....	B.5
Ducts .....	<i>see</i> Air ducts

Electrical conductors, branch-circuit .....	10.4.1, 10.4.4(2)
Electrical power .....	<i>see</i> Power supply

Copyright NFPA

Electrical service, information technology equipment rooms .....	5.6, 10.3, A.10.3
Electrical supply circuits and interconnecting cables .....	10.4, A.10.4.3 to A.10.4.10
Electronic computer system .....	<i>see</i> Information technology equipment
Electronically interconnected (definition) .....	3.3.6
Emergency lighting .....	10.3.6
Emergency plans and planning .....	Chap. 11, Annex B
Emergency power shutdown .....	8.2.2, A.8.1.2, A.11.1
Enclosures	
For information technology equipment .....	7.1.2, 7.1.4, A.7.1.2, A.7.1.4
Penetrations, fire-resistant-rated enclosures .....	5.5
Equivalency to standard .....	1.5
Expansion or renovations, effect on fire protection .....	8.7
Extinguishers, portable fire .....	8.3.1 to 8.3.3, 9.2.2, A.8.3.2
	6.2.2, 7.1.2, 8.7.1, A.8.2, A.10.4.5, A.11.1; <i>see also</i> Gaseous agent
Extinguishing systems .....	systems; Sprinkler systems

Fire dampers .....	<i>see</i> Dampers, fire and smoke
Fire division, separate (definition) .....	3.3.15
Fire fighters, fire safety of .....	11.1.1
Fire protection .....	Chap. 8; <i>see also</i> Alarms; Detection systems; Extinguishers, portable fire; Extinguishing systems
Fire-resistant-rated construction	
Definition .....	3.3.7
Information technology equipment area, use in .....	5.1.3, 6.2.2, A.5.1.3
Penetrations .....	5.5
Fire service orientation and information .....	11.1.1.2, A.11.1.1.2
Fire shutters .....	5.5.2



Fire stops .....	5.5.1
Fire windows .....	5.5.2
Floors	
Drainage system .....	5.3.2
Raised .....	<i>see</i> Raised floors
Furniture, information technology equipment room .....	6.1.2

Gaseous agent systems .....	8.1.1.1, Annex D; <i>see also</i> Inert gas extinguishing systems
Carbon dioxide extinguishing systems .....	8.1.1.2, A.8.1.1.2
Compatibility to facility operation .....	D.1.2(7), D.7

Copyright NFPA

Discharge of agent .....	D.3
Effectiveness of fire-suppressing agent .....	D.2
Halon 1301 agent and system availability .....	D.6
Personnel, hazard to .....	D.1.1, D.1.2(5), D.5
Products of combustion, creation of .....	D.1.2(4), D.4
Products of extinguishing agent breakdown .....	D.1.2(4), D.4
Total flooding systems .....	8.4, A.8.4.1, Annex D
Grounding of system .....	10.4.10, A.10.4.10

Halogenated extinguishing systems .....	A.8.1.1.2, D.2
---	----------------

Halon 1301 agent and system availability .....	D.6
Heat detectors (definition) .....	3.3.5.1
Heating, ventilating, and air conditioning (HVAC) systems .....	10.1, 10.4.8, A.5.1.3, A.10.1.4, A.11.1; <i>see also</i> Air-handling systems
Hose lines .....	8.3.4, 8.3.5, 9.2.2

Important records .....	<i>see</i> Records, important
Inert gas extinguishing systems .....	8.1.1.2, 8.4.2, A.8.1.1.2, D.1.1
Information technology equipment	
Construction .....	Chap. 7
Damage control .....	11.2, A.8.1.2, A.11.1, A.11.2, Annex B

Copyright NFPA

De-energizing .....	8.5, 10.4.8, A.8.1.2, A.11.1, D.1.2(2)
Electrical service .....	10.3, A.10.3
High temperature damage .....	C.3(1)
Information technology equipment room, permitted in .....	6.1.1, A.6.1.1
Risk considerations .....	<i>see</i> Risk considerations
Information technology equipment areas .....	<i>see also</i> Information technology equipment rooms
Construction .....	5.1, A.5.1
Definition .....	3.3.8
Diagram of .....	Fig. A.5.1.3
Equipment permitted in .....	Chap. 6
Expansion or renovation .....	8.7
Fire protection .....	Chap. 8
Location .....	5.1.1, 5.2, A.5.1.3, A.5.2
Materials permitted in .....	5.3, Chap. 6
Security .....	A.5.2
Support rooms .....	A.5.1.3
Information technology equipment rooms .....	<i>see also</i> Information technology equipment areas
Definition .....	3.3.9
Electrical installation and wiring .....	10.3, A.10.3
Fire protection .....	Chap. 8
Storage .....	9.1, A.9.1
General storage .....	6.3
Records .....	6.2
Utilities .....	1.6, Chap. 10
Information technology equipment systems	
Definition .....	3.3.10
Electrical service .....	10.3, A.10.3
Inks, storage of .....	6.3.1, 6.3.2, 6.3.3
Interconnecting cables .....	10.4.3, A.10.4.3

Definition .....	3.3.11
Under raised floors .....	10.4.4, A.10.4.4
Interior finish .....	5.3.1
Interlock devices .....	8.2.2

Junction boxes .....	10.3.5, A.10.3.5
----------------------	------------------

Labeled (definition) .....	3.2.3
Lighting, emergency .....	10.3.6
Lightning surges .....	10.3.4, A.10.3.4
Liquids, in computer equipment .....	7.2.2
Listed (definition) .....	3.2.4, A.3.2.4

Magnetic media

High temperature damage .....	C.3(2)
Recovery .....	Annex B
Storage .....	6.2.2, 6.3.1, 6.3.2
Tape libraries, protection of .....	6.2.2
Tapes, recovery of .....	B.5
Markings on equipment .....	10.4.11
Master records (definition) .....	3.3.14.2
Microfilm, high temperature damage of .....	C.3(5)

Noncombustible (definition) .....3.3.12



Paper	
High temperature damage .....	C.3(4)
Storage .....	6.3.1, 6.3.2, 6.3.3
Penetrations, fire-resistant-rated enclosures .....	5.5
Personnel, hazards to	
Fire fighters, fire safety of .....	11.1.1, A.11.1.1.2
Gaseous agent systems .....	D.1.1, D.1.2(5), D.5
Plastics, cellular .....	5.3.1.3
Power supply	
Continuous power .....	8.5
Disconnecting means .....	8.5, 10.4.8
Copyright NFPA	

Shutdown of power .....	8.2.2, A.8.1.2, A.11.1, D.1.2(2), D.2, D.7
Uninterruptible power supplies (UPS) .....	10.4.9, A.10.4.9.1
Purpose of standard .....	1.2, A.1.2

Raised floors .....	5.3.2, 5.4, A.5.1.3, A.5.3.2, A.5.4
Cables under .....	10.4.4, A.10.4.4
Definition .....	3.3.13, A.3.3.13
Detection system in .....	8.2.1, A.8.2.1
Extinguishing system for area below floor .....	8.1.1.2, A.8.1.1.2
Storage in area below floor .....	6.3.3

Copyright NFPA

Wiring in air spaces .....	5.6, 10.3.1
Records	
Important	
Definition .....	3.3.14.1
Storage .....	9.1(1), 9.2.1, A.9.2.1
Master (definition) .....	3.3.14.2
Protection of .....	Chap. 9
Storage	
Inside information technology equipment area .....	9.1, A.9.1
Inside information technology equipment room .....	6.1.1.2, 6.2
Outside information technology equipment room .....	9.2, 9.2.1, A.9.2.1
Vital	
Definition .....	3.3.14.3
Storage .....	9.1(1), 9.2.1, A.9.2.1
Recovery procedures .....	11.3, A.11.3
References .....	Chap. 2, Annex E
Retroactivity of standard .....	1.4
Risk considerations .....	Chap. 4, Annex C
Risk factors .....	4.1
Telecommunications risks .....	4.2

Scope of standard .....	1.1
Separate fire division (definition) .....	3.3.15
Shall (definition) .....	3.2.5
Should (definition) .....	3.2.6
Shutters, fire .....	5.5.2
Smoke damage to electronic equipment .....	B.2, B.3
Smoke dampers .....	<i>see</i> Dampers, fire and smoke
Smoke detectors .....	8.2, 10.1.1, A.8.2, A.10.1.4
Definition .....	3.3.5.2
Sprinkler systems .....	5.1.1, 5.3.1.1, 5.3.1.2.1, 5.3.2, 8.1, 8.4.1, A.5.1.3, A.8.1.2, A.8.1.4, A.8.4.1

Copyright NFPA

## Storage

Information technology equipment area .....	6.2, 6.3, 9.1, A.9.1
Records .....	<i>see</i> Records
Structural members for raised floors .....	5.4.1
Supply circuits .....	10.4, A.10.4.3, A.10.4.4

Tapes .....	<i>see</i> Magnetic media
Telecommunications risks .....	4.2
Temperature considerations .....	C.1.4, C.3
Training, in fire protection systems .....	8.6

Copyright NFPA

Transformers ..... 10.3.2, 10.3.3, A.10.3.2  
Trash receptacles ..... 6.1.3

Uninterruptible power supplies (UPS) ..... 10.4.9, A.10.4.9.1  
Utilities ..... 1.6, Chap. 10

Ventilation ..... *see* Air-handling systems; Heating, ventilating, and air conditioning (HVAC) systems

Vital records ..... *see* Records, vital

Water damage to electronic equipment .....B.2, B.4

Water sensors (definition) .....3.3.16

Windows, fire .....5.5.2

Wiring .....5.6, 10.3, A.10.3