NFPA 75

Standard for the

Protection of Information Technology Equipment

2003 Edition

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 November Association Technical Meeting held November 16–20, 2002, in Atlanta, GA. It was issued by the Standards Council on January 17, 2003, with an effective date of February 6, 2003, and supersedes all previous editions.

This edition of NFPA 75 was approved as an American National Standard on January 17, 2003.

Origin and Development of NFPA 75

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

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

This revision incorporates the NFPA *Manual of Style* recommendations.

In previous editions of this standard, the terms “electronic computer/data processing equipment” and “electronic computer system” were used where the present terms “information technology equipment” and “information technology equipment system” are used, respectively. Similarly, the terms “computer room” and “computer area” have been replaced by “information technology equipment room” and “information technology equipment area,” respectively. While the title and some terminology in this standard have changed to more closely align this standard’s terminology with terminology presently being used in other standards, such as NFPA 70, *National Electrical Code*®, and UL 60950, *Standard for Safety of Information Technology Equipment*, the scope of this standard and

any definitions associated with these like terms remain the same.

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

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.

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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, Annex E lists the complete title and edition of the source documents for both mandatory and nonmandatory extracts. Editorial changes to extracted material consist of revising references to an appropriate division in this document or the inclusion of the document number with the division number when the reference is to the original document. 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.

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.

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, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 10, *Standard for Portable Fire Extinguishers,* 2002 edition.

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems,* 2000 edition.

NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems,* 1997 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* 2002 edition.

NFPA 14, *Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems,* 2003 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* 2002 edition.

NFPA 70, *National Electrical Code®,* 2002 edition.

NFPA 72®, *National Fire Alarm Code®,* 2002 edition.

NFPA *101®*, *Life Safety Code®,* 2003 edition.

NFPA 220, *Standard on Types of Building Construction,* 1999 edition.

NFPA 232, *Standard for the Protection of Records,* 2000 edition.

NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials,* 2000 edition.

NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems,* 2000 edition.

2.3 Other Publications.

2.3.1 ASTM Publications.

American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

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.

UL 72, *Standard for Tests for Fire Resistance of Record Protection Equipment*, 2001.

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

UL 900, *Standard for Test Performance of Air Filter Units,* 1994.

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

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

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 included, common usage of the terms shall apply.

3.2 NFPA Official Definitions.

3.2.1* **Approved.** Acceptable to the authority having jurisdiction.

3.2.2* **Authority Having Jurisdiction (AHJ).** The organization, office, or individual responsible 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 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 where determining the need for protecting the environment, equipment, function, programming, records, and supplies:

(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

(4) Economic loss from value of equipment

4.2 Telecommunications Risks.

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 lines. If these functions are vital to the operation, rooms housing the services shall be constructed in accordance with Chapter 5 and protected in accordance with Chapter 8. These rooms shall be secured, locked, and free of extraneous combustibles.

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 non-sprinklered 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 non-sprinklered 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 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 restrict the movement of smoke from one side of the fire-resistant-rated construction to the other. The fire resistance rating for doors shall be as follows:

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

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

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 rating of 25 or less in accordance with NFPA 255, *Standard Method of Test of 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 rating of 25 or less in accordance with NFPA 255, *Standard Method of Test of 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 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 of 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*, or UL 60950, *Standard for Safety of Information Technology Equipment*.

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

7.1.3* 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.

7.1.4* 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 rating of 50 or less. 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, *Standard for Safety of Information Technology Equipment*, 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°C (300°F) 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 of 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 non-sprinklered building shall be provided with an automatic sprinkler system or a gaseous clean agent extinguishing system or both *(see Section 8.4)*.

8.1.1.2* Either an automatic sprinkler system, carbon dioxide extinguishing system, or inert agent fire extinguishing system for the protection of the area below the raised floor in a 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^3 (27 ft^3) 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–type 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, Private Hydrant, 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 given to the use of a gaseous agent inside units or total flooding systems in sprinklered or non-sprinklered 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.

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 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 limitations of each available type of extinguisher and the proper operating procedures of the extinguishing systems.

8.6 Expansion or Renovations.

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.

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 of 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 10.4.7. 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 10.4.7.

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 rating not over 25 without evidence of continued progressive combustion and a smoke developed rating no higher than 50.

10.1.4* Air filters for use in air-conditioning systems shall have a Class 1 rating in accordance with UL 900, *Standard for Test Performance of 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 an information technology equipment 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 information technology equipment system shall be permitted to be connected to a branch circuit by any of the following means listed for the purpose:

(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, they shall be protected against physical damage. [**70:**645.5(B)]

10.4.3* Interconnecting Cables. Separate information technology equipment shall be permitted to be interconnected by means of cables and cable assemblies listed for the purpose. Where run on the surface of the floor, they shall be protected against physical damage. [**70:**645.5(C)]

10.4.4* Under Raised Floors. Power cables, communications cables, connecting cables, interconnecting cables, 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) Ventilation in the underfloor area is used for the information technology equipment room only.

(4) Openings in raised floors for cables protect cables against abrasions and minimize the entrance of debris beneath the floor.

(5) 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 with one or more yellow stripes insulated single conductor cables, AWG 4 and larger, marked "for use in cable trays" or "for CT use" shall be permitted for equipment grounding.

(6)* Abandoned cables shall not be permitted to remain unless contained in metal raceways. [**70:**645.5(D)]

10.4.5 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)]

10.4.6* Cables Not in Information Technology Equipment Room. Cables extending beyond the information technology equipment room shall be subject to the applicable requirements of NFPA 70, *National Electrical Code*®. [**70:**645.6]

10.4.7 Disconnecting Means. A means shall be provided to disconnect power to all electronic equipment in the information technology equipment room. There shall also be a similar means to disconnect the power to all dedicated HVAC systems serving the room and 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 shall be permitted. Where a pushbutton is used as a means to disconnect power, pushing the button in shall disconnect the power. [**70:**645.10]

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

10.4.8 Uninterruptible Power Supplies (UPS). Unless otherwise permitted in (1) or (2), UPS systems installed within the information technology room, and their supply and output circuits, shall comply with 10.4.7. 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 capable of supplying 750 volt-amperes or less derived either from UPS equipment or from battery circuits integral to electronic equipment. [**70:**645.11]

10.4.8.1* Storage battery systems in the information technology equipment area shall

comply with the requirements of NFPA 70, *National Electrical Code®*, Article 480.

10.4.9* Grounding. All exposed non-current-carrying metal parts of an information technology system shall be grounded 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 system provided for the information technology equipment. [**70:**645.15]

10.4.10 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.

11.2* 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 upon 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 "authority 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.4.1 See Annex C.

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.

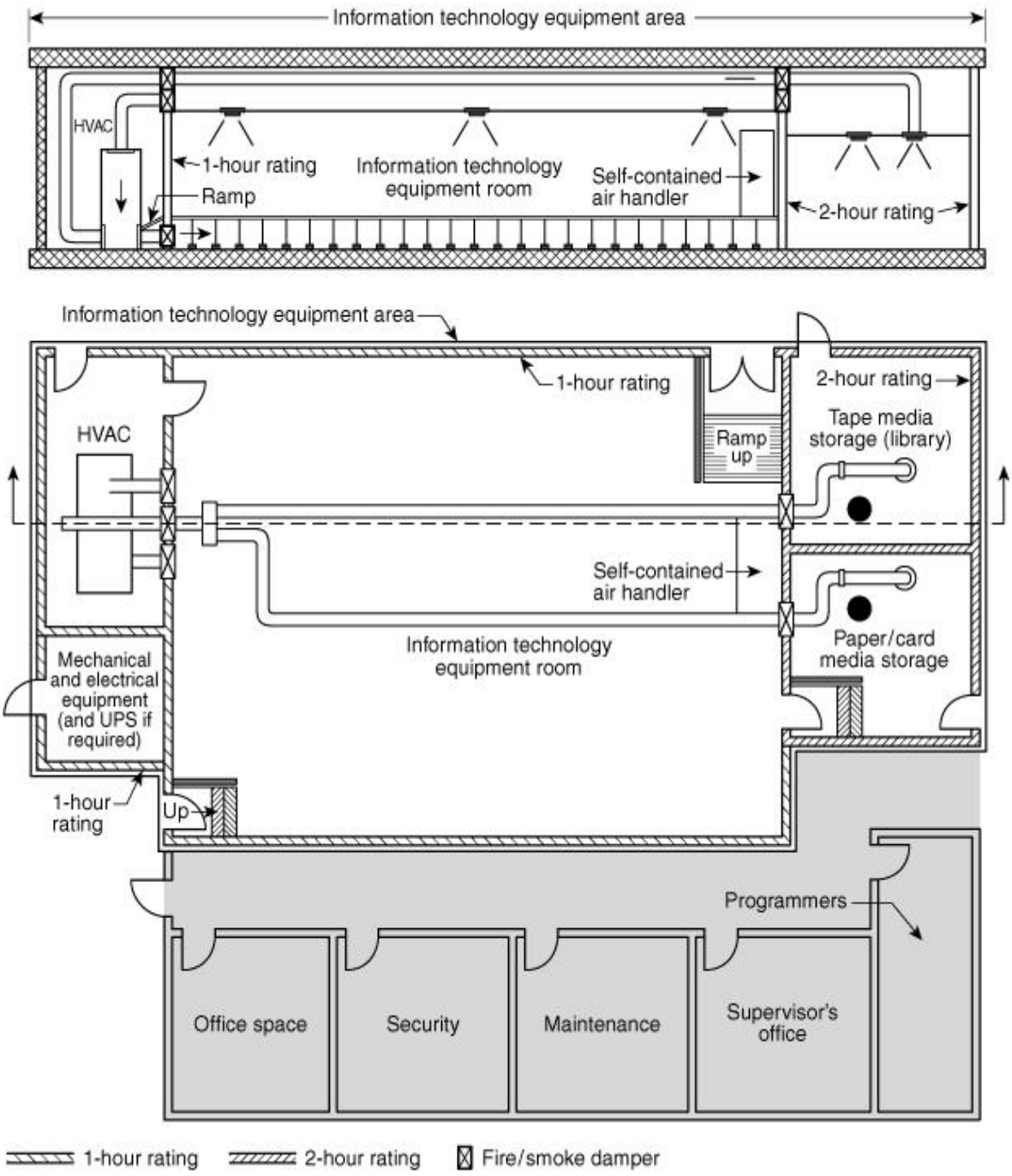

FIGURE A.5.1.3 Diagram of Information Technology Equipment Area.

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. As 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 of the information technology equipment room whenever possible.

A.7.1.3 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 paragraph 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 fire suppression system may 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 made 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^3 (27 ft^3) of combustible storage space or less need not be provided with protection within the unit. The 0.76-m^3 (27-ft^3) 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 to specific critical data or equipment or of serious interruption to operations cannot be resolved or alleviated by equipment redundancy, subdivision of the information technology equipment area, or the 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.8.4.2 See Annex D.

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 Pre-discharge 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, a significant amount of dust and lint can accumulate on the heating elements and, when the elements are energized, 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 cable. 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, *Safety Reference 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.10.4.4(6) Abandoned cable can interfere with airflow and extinguishing systems. Abandoned cable also adds to the fuel loading.

A.10.4.6 For signaling circuits, refer to NFPA 70, *National Electrical Code®*, Article 725; for fiber optic circuits, 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.

A.10.4.8.1 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.10.4.9 The bonding and grounding requirements in the product standards governing this listed equipment ensure that it complies with NFPA 70, *National Electrical Code®*, Article 250.

Where isolated grounding–type receptacles are used, see NFPA 70, 250.146(D) and 406.2(D).

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.11.2 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 other operations and 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 the water, smoke, or other contaminations are 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 upon 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) Alternate 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 was extracted from *Electronics & 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 (40–50 percent relative 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 This 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 being 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 for 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 elevated, sustained 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°C (175°F) 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°C (100°F). However, damages occurring between 37.8°C (100°F) and 48.9°C (120°F) can generally be reconditioned successfully, whereas the chance of successful reconditioning lessens rapidly with elevations of sustained ambient temperatures above 48.9°C (120°F).

(3) Damage to disc media can begin at sustained ambient temperatures above 65.6°C (150°F) 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°C (350°F). 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°C (225°F) in the presence of steam or at 260°C (500°F) 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. Where 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, the operator 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 a number of factors in integrating them into a facility. These factors are as follows:

(1) Effectiveness of agent on types of fires expected

(2) Energized versus de-energized equipment

(3) Possible effect of "neat" agent discharges on equipment and/or space protected

(4) Dealing with products of combustion and/or products of decomposition created in fire and fire suppression

(5) Potential hazard to personnel

(6) Long-term availability of agent and/or system components

(7) Compatibility of system operation to facility operation

(8) Selection of detection system used

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 shutting off of power. Continued application of electrical power to information technology equipment may result in ongoing electrical arcing or sustained high temperature "hot 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 can be needed. Some gases, especially carbon dioxide, when released, will rapidly expand in a room or enclosure, which will cause 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 detecting and suppressing fires while they are small, extinguishing any open burning quickly, and eliminating 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, which can cause hazards to personnel, require a predischarge warning and evacuating system. In the event of a fire, any 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. Even though there is no new gas being produced, there is an availability of recycled gas. If an owner wants to use a system with halon, he or she 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 need to hold that concentration long enough to allow operator intervention to isolate and eliminate the continuing ignition source is 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 following documents or portions thereof are referenced within this standard for informational purposes only and are thus not part of the requirements of this document unless also listed in Chapter 2.

E.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 10, *Standard for Portable Fire Extinguishers*, 2002 edition.

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*, 2000.

NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems*, 1997 edition.

NFPA 70, *National Electrical Code®*, 2002 edition.

NFPA 80A, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures*, 2001 edition.

NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, 2000 edition.

NFPA 780, *Standard for the Installation of Lightning Protection Systems*, 2000 edition.

NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*, 2000 edition.

E.1.2 Other Publications.

E.1.2.1 CSA Publication. Canadian Standards Association, 178 Rexdale Boulevard, Rexdale, Ontario M9W 1R3, Canada.

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

E.1.2.2 UL Publication. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.

UL 1581, *Reference Standard for Electrical Wires, Cables and Flexible Cords*, 1997.

E.1.2.3 Other Publication. *Electronics & Magnetic Media Recovery*, Blackmon-Mooring-Steamatic Catastrophe, Inc., International Headquarters, 308 Arthur Street, Fort Worth, TX 76107, (817) 332-6319, fax (817) 332-6728.

E.2 Informational References. (Reserved)

E.3 References for Extracts.

The following document is listed here to provide reference information, including title and edition, for extracts given throughout this standard as indicated by a reference in brackets [ ] following a section or paragraph. This document is not a part of the requirements of this document unless also listed in Chapter 2 for other reasons.

NFPA 70, *National Electrical Code*®, 2002 edition.