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NFPA 75 Protection of Electronic Computer/Data Processing Equipment 1992 Edition

National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101

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Policy Adopted by NFPA Board of Directors on December 3, 1982

The Board of Directors reaffirms that the National Fire Protection Association recognizes that the toxicity of the products of combustion is an important factor in the loss of life from fire. NFPA has dealt with that subject in its technical committee documents for many years.

There is a concern that the growing use of synthetic materials may produce more or additional toxic products of combustion in a fire environment. The Board has, therefore, asked all NFPA technical committees to review the documents for which they are responsible to be sure that the documents respond to this current concern. To assist the committees in meeting this request, the Board has appointed an advisory committee to provide specific guidance to the technical committees on questions relating to assessing the hazards of the products of combustion.

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NFPA 75

Standard for the Protection of

Electronic Computer/Data Processing Equipment

1992 Edition

This edition of NFPA 75, *Standard for the Protection of Electronic Computer/Data Processing Equipment*, was prepared by the Technical Committee on Electronic Computer Systems and acted on by the National Fire Protection Association, Inc. at its Annual Meeting held May 18-21, 1992 in New Orleans, LA. It was issued by the Standards Council on July 17, 1992, with an effective date of August 14, 1992, and supersedes all previous editions.

The 1992 edition of this document has been approved by the American National Standards Institute.

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 this 1992 Edition.

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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.

Contents

NFPA 75

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

Information on referenced publications can be found in Chapter 11 and Appendix D.

Chapters and sections identified by a dagger (†) include text extracted from another NFPA document. The document and paragraph reference can be found in a note at the beginning of Chapter 10. Requests for interpretations or revisions of the extracted text will be referred to Panel No. 12 of the National Electric Code Committee.

Chapter 1 Introduction

1-1 Scope. This standard covers the requirements for the protection of electronic computer/data processing equipment rooms and computer areas.

1-2* Applicability. The application of this standard shall be based on the risk considerations outlined in Chapter 2. The mere presence of the electronic computer/data processing equipment does not constitute the need to invoke the requirements of this standard.

1-3 Purpose. The purpose of this standard is to set forth the minimum requirements for the protection of electronic computer/data processing equipment and areas from damage by fire or its associated effects, i.e., smoke, corrosion, heat, and water.

1-4 Definitions. Unless expressly stated elsewhere, the following terms shall, for the purpose of this standard, have the meanings indicated below.

Approved. Acceptable to the "authority having jurisdiction."

NOTE: 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 or 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 concerned with product evaluations which is in a position to determine compliance with appropriate standards for the current production of listed items.

Authority Having Jurisdiction. The "authority having jurisdiction" is the organization, office or individual responsible for "approving" equipment, an installation or a procedure.

NOTE: The phrase "authority having jurisdiction" 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, 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 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."

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

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.

Computer Area. An area of a building where the computer room is located including support rooms served by the same special air conditioning/air handling equipment as the computer room.

Computer Room. A room within the computer area that contains the electronic computer/data processing equipment.

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

Easily Accessible. When the covers, panels, doors, or other enclosures for the electronic components within the equipment or the flooring can be removed or opened by quick, simple operations to expose any area that might be involved in fire and permit the application of an extinguishing medium.

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

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

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.

Heat Detector. A device that detects abnormally high temperature or rate-of-temperature rise.

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

Labeled. Equipment or materials to which has been attached a label, symbol or other identifying mark of an organization acceptable to the "authority having jurisdiction" and concerned with product evaluation, that maintains periodic inspection of production of labeled equip-

ment or materials and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

Listed. Equipment or materials included in a list published by an organization acceptable to the "authority having jurisdiction" and concerned with product evaluation, that maintains periodic inspection of production of listed equipment or materials and whose listing states either that the equipment or material meets appropriate standards or has been tested and found suitable for use in a specified manner.

NOTE: The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which 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.

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

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 E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, and conforming to the criteria contained in Section 6 of the referenced standard, shall be considered as noncombustible.

Program. Instructions to direct system operation.

Raised Floor. A platform with removable panels on which equipment is installed, with the intervening space between it and the main building floor used to house the interconnecting cables and at times as a means for supplying conditioned air to the data processing equipment and the room. (Sometimes referred to as a false floor or secondary floor.)

Records, Important. Records of which a reproduction could be obtained only at considerable expense and labor or only after considerable delay.

Records, Vital. 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 with which 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.

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 may occur in one fire division from extending to another fire division.

Shall. Indicates a mandatory requirement.

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

Smoke Detector. A device that detects the visible or invisible particles of combustion.

Supervision. Continuous surveillance of a system or operation by special supervisory equipment or personnel to alert those responsible that failure has occurred or that a hazardous condition is being approached.

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

1-5 Equivalency Concepts.

1-5.1 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 to those prescribed by this standard, provided technical documentation is submitted to the authority having jurisdiction to demonstrate equivalency.

1-5.2 Equivalent protection features accepted by the authority having jurisdiction shall be considered as conforming with this standard.

Chapter 2 Risk Considerations

2-1* Risk Factors. The following factors shall be considered when determining the need for protecting the environment, equipment, function, programming, records, and supplies:

(a) Life safety aspects of the function (e.g., process controls, air traffic controls);

(b) Fire threat of the installation to occupants or exposed property;

(c) Economic loss from loss of function or loss of records; and

(d) Economic loss from value of equipment.

2-2 Telecommunications Risks. In assessing and evaluating the damage and interruption potential of the loss of computer room operations, attention shall be given to the impact of the loss of data and communications lines. The complexity and scope of on-line computer operations make it necessary to link the computer to access terminals and other computers to perform a wide variety of functions.

If this is vital to the operation, rooms housing the services shall be constructed in accordance with Chapter 3 and protected in accordance with Chapter 6. These rooms shall be secured, locked, and free of extraneous combustibles.

Chapter 3 Construction Requirements

3-1* Building Construction.

3-1.1 The computer area shall be housed in one of the following:

(a) A building constructed in accordance with NFPA 220, Type I (443) or (332), or Type II (222) or (111).

(b) A single story building constructed in accordance with NFPA 220, Type II (000).

Exception: A computer area that is housed in a fully sprinklered building in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems.

3-1.2* Where exposure to the building housing the computer is unfavorable, appropriate exposure protection shall be provided.

3-1.3* The computer area shall be separated from other occupancies within the building (including atria or other open space construction) by fire-resistant rated construction. The computer room shall be separated from other occupancies in the computer area by fire-resistant rated construction. The fire resistance rating shall be commensurate with the exposure but not less than one hour for both. (*See Appendix B.*)

3-1.3.1 The fire-resistant rated enclosures shall extend from the structural floor to the structural floor above or to the roof.

3-2* Location of Computer Room within the Building.

3-2.1* The computer room shall not be located above, below, or adjacent to areas or other structures where hazardous processes are located unless adequate protective features are provided.

3-3 Computer Area Interior Construction Materials.

3-3.1* All materials used in construction, including walls, floors, partitions, finish, acoustical treatment, raised floors, suspended ceilings, and other construction materials involved in the computer area, shall have a flame spread rating of 25 or less. (*See NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials.*)

Exception: Resilient tiles or high-pressure plastic laminates may be used as the wearing surface on any exposed floors. Carpeting shall have a critical radiant flux of not less than 0.45 watts/cm^2 (0.51 Btu/ft^2 sec) as tested in accordance with NFPA 253, Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source, and shall not restrict the lifting of panels for access to underfloor space.

3-3.1.1 Exposed cellular plastics shall not be used in computer area construction.

Exception: Plastics within a fire-rated assembly are permitted.

3-3.2* A structural floor on which a computer 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.

3-4* Raised Floors.

3-4.1 Structural supporting members for raised floors shall be of noncombustible material.

3-4.2 Decking for raised floors shall be noncombustible.

Exception No. 1: Pressure-impregnated, fire-retardant treated lumber having a flame spread rating of 25 or less shall be permitted. (See NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials.)

Exception No. 2: 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 shall be permitted. (See NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials.)

3-4.3 Access sections or panels shall be provided in raised floors so that all the space beneath is accessible.

3-4.3.1 Tools needed to provide access to the underfloor space shall be located in the computer room and their location shall be well marked.

3-4.4* Electric cable openings in floors shall be made smooth or shall be otherwise protected to preclude the possibility of damage to the cables.

3-5 Cable Openings and Other Penetrations.

3-5.1 Cable openings or other penetrations through required fire-rated assemblies shall be fire stopped with a properly installed listed fire stopping material that has a fire resistance rating equal to the fire resistance rating of the penetrated barrier when tested with a minimum positive furnace pressure differential of 0.01 in. of water (2.5 Pa) under ASTM E814, *Standard Method of Fire Tests of Through-Penetration Fire Stops.*

3-5.2 Where any openings (e.g., pass-throughs or windows) are installed in the fire-rated wall of a computer room, each opening shall be equipped with an automatic-rated fire shutter. The shutter shall be operated automatically by the presence of either smoke or fire on either side of the wall.

Exception: Fire-rated windows of equal rating to the wall shall be permitted.

3-6 Air Space. When the air space below a raised floor or above a suspended ceiling is used to recirculate computer room/computer area environmental air, the construction of such spaces shall be noncombustible. All wiring shall conform to Article 645 of NFPA 70, *National Electrical Code®.* (*See Chapter 10.*)

NOTE: Exception No. 1 to 3-4.2 is not applicable to this provision.

Chapter 4 Materials and Equipment Permitted in the Computer Area

4-1 General.

4-1.1* Only computer equipment and support equipment shall be permitted in the computer room.

Exception No. 1: Small supervisory offices and similar light hazard occupancies directly related to the electronic equipment operations shall be permitted within the computer room if noncombustible containers are provided for combustible material.

Exception No. 2: Records shall be permitted in the computer room to the extent allowed in Chapter 7.

4-1.2 Office furniture in the computer room shall be of metal construction.

Exception No. 1: Metal frame chairs with integral seat cushions shall be permitted.

Exception No. 2: Insulated or controlled conductive coverings shall be permitted on surfaces of chairs, tables, desks, etc.

4-1.3 Only approved self-extinguishing-type trash receptacles shall be used in the computer room.

4-2 General Storage.

4-2.1 Paper stock, inks, unused recording media, and other combustibles within the computer room shall be restricted to the absolute minimum necessary for efficient operation. Any such materials in the computer 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.

4-2.2 Reserve stocks of paper, inks, unused recording media, and other combustibles shall be stored in one or more rooms outside of the computer room.

4-2.3 The space beneath the raised floor shall not be used for storage purposes.

4-2.4* Abandoned cables shall not be allowed to accumulate. Cables not identified for future use shall be removed.

Chapter 5 Construction of Computer Equipment

5-1 Computer Equipment.

5-1.1 Equipment and replacement parts shall meet the requirements of UL 478, *Standard for Safety Information-Processing and Business Equipment*, or UL 1950, *Standard for Safety Information Technology Equipment Including Electrical Business Equipment.*

5-1.2 Listed equipment shall be considered as meeting the requirements of 5-1.3.

5-1.3* 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 in which the source of ignition is located. Automatic protection shall be provided for all units not so constructed.

5-1.4 Enclosures of floor standing equipment having external surfaces of combustible materials of such size that might contribute to the spread of an external fire shall have a flame spread rating of 50 or less. (*See NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials.*)

5-2 Construction Features.

5-2.1* Cables. Interconnecting cables and wiring between units, power cords, plugs, and connectors shall be listed. They shall be considered as part of the computer system and suitable for installation on the floor or under a raised floor as described in Section 3-4.

5-2.2 Cords. Approved flexible cord and plug assemblies used for connecting computer equipment to the branch circuit to facilitate interchange shall not exceed 15 ft (4.57 m) in length.

5-2.3 Filters. Air filters for use in the cooling systems of individual units shall be listed. They shall be arranged in such a way that they can be readily removed, inspected, cleaned, or replaced when necessary.

5-2.4 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 300°F (149°C) or higher, and the container shall be of a sealed construction, incorporating automatic pressure relief devices.

5-2.5 Acoustical Materials. All sound-deadening material used inside of computer 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 6 Fire Protection and Detection Equipment

6-1* Automatic Sprinkler Systems.

6-1.1 An automatic sprinkler system shall be provided to protect the computer rooms or computer areas where:

(a) The computer room construction contains any combustible materials other than permitted in 3-3.1, or

(b) The enclosure of a unit in a computer system, or the unit's structure, is built all or in part of a significant quantity of combustible materials, or

(c) The operation of the computer room involves a significant quantity of combustible materials, or

(d) The building is otherwise required to be sprinklered.

6-1.2 Automatic sprinkler systems protecting computer rooms or computer areas shall be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems.*

NOTE: 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.

6-1.3 Sprinkler systems protecting computer rooms shall be valved separately from other sprinkler systems.

6-1.4* AISS units containing combustible media shall be protected by automatic sprinklers within each unit.

Exception No. 1: This requirement does not apply to an AISS unit or units that have an aggregate storage capacity of 27 cu ft or less.

Exception No. 2: Where the unit is protected by a gaseous agent extinguishing system with an extended discharge.

6-2* 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 72E, *Standard on Automatic Fire Detectors.*

6-2.1* Automatic detection systems shall be installed in the following locations:

(a) At the ceiling level throughout the computer area.

(b) Below the raised floor of the computer area containing cables.

(c) Above the suspended ceiling and below the raised floor in the computer room where these spaces are used to recirculate air to other parts of the building.

6-2.2 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.

6-2.3 The alarms and trouble signals of automatic detection or extinguishing systems shall be arranged to annunciate at a constantly attended location.

6-3 Portable Extinguishers and Hose Lines.

6-3.1 Listed portable extinguishers suitable for use on electronic equipment shall be provided. They shall be maintained in accordance with NFPA 10, *Standard for Portable Fire Extinguishers.*

6-3.2 Listed extinguishers with a minimum rating of Class 2A shall be provided for use on fires in ordinary combustible materials, such as paper and plastics. (*See NFPA 10, Standard for Portable Fire Extinguishers.*) Dry chemical extinguishers shall not be permitted.

6-3.3 A sign shall be located adjacent to each portable extinguisher and shall plainly indicate the type of fire for which it is intended.

6-3.4 In installations where inside hose is provided, the hose shall be 1½-in. (3.81-cm) rubber-lined hose with shut-off 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 shall be permitted.

6-3.5 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.*

6-4 Gaseous Total Flooding Extinguishing Systems.

6-4.1* 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 gaseous agent total flooding systems in sprinklered or non-sprinklered computer rooms.

6-4.2* In installations where gaseous agent total flooding systems are used, they shall be installed and maintained in accordance with the requirements of NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems*, or NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems.*

6-4.3* Gaseous agent systems shall be automatically actuated by an approved method of detection meeting the requirements of NFPA 72E, *Standard on Automatic Fire Detectors*, and a listed releasing device compatible with the system.

6-4.4 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.

6-4.5 Alarms shall be provided to give positive warning of a pending discharge and an actual discharge.

6-5 Training. Designated computer room 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 the use of all available extinguishing equipment. This training shall encompass both the capabilities and limitations of each available type of extinguisher, and proper operating procedures of the extinguishing systems.

6-6 Expansion or Renovations. Whenever significant changes are made to the computer room (e.g., size, installation of new partitions, modification of the air handling systems, or revised computer equipment layout), the potential impact on existing fire detection and extinguishing systems shall be evaluated, and appropriate changes shall be made.

Chapter 7 Protection of Records

7-1 Protection Required for Records within the Computer Room.

7-1.1 The amount of records within the computer room shall be kept to the absolute minimum required for essential and efficient operation. Only records that are essential to the computer operations should be permitted to be kept in the computer room.

Exception: An AISS conforming to the requirements of 6-1.4 shall be permitted in the computer room.

7-1.2* Any records regularly kept or stored in the computer room shall be provided with the following protection:

(a) Vital or important records that have not been duplicated shall be stored in approved Class 150 one-hour or better record protection equipment.

(b) All other records shall be stored in closed metal files or cabinets.

7-2 Records Stored outside of the Computer Room.

7-2.1* Vital and important records that have not been duplicated shall be stored in fire-resistive rooms. The degree of fire resistance shall be commensurate with the fire exposure to the records but not less than two hours. (*See Section 7-3.*)

7-2.2 The records storage room shall be used only for the storage of records. All other operations including splicing, repairing, erasing, reproducing, cataloging, etc., shall be prohibited in this room.

Exception: 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.

7-2.3 Portable extinguishing equipment and hose lines for record storage rooms or areas shall be installed in accordance with 6-3.1 through 6-3.5.

7-3 Duplication of Records. All vital and important records shall be duplicated or protected and located in accordance with NFPA 232, *Standard for the Protection of Records*. Duplicate records shall be stored in an area that is not subject to the same fire, or its associated effects, as the originals.

Chapter 8 Utilities

8-1 Heating, Ventilating, and Air Conditioning (HVAC). An air conditioning system shall be provided for the computer room/media storage room and shall comply with one of the following:

(a) An HVAC system that is dedicated for electronic computer/data processing equipment use and is separated from other areas of occupancy shall be used.

(b) Any HVAC system that serves other occupancies shall also be permitted to serve the computer room/media storage room. The air ducts shall be provided with automatic fire and smoke dampers.

8-1.1 Dampers in HVAC systems serving computer rooms/media storage rooms shall operate upon activation of smoke detectors and by operation of the disconnecting means required by NFPA 70, Section 645-10.

8-1.2 Air ducts serving other rooms either shall not pass through the electronic equipment rooms or fire dampers shall be provided in the ducts.

8-1.3 All duct insulation and linings, including vapor barriers and coatings, shall be noncombustible.

8-1.4* Air filters for use in air conditioning systems shall be noncombustible and installed in accordance with manufacturer's instructions.

8-2 Coolant Systems. If a separate coolant system is required for operation of a computer installation, it shall be provided with a suitable alarm to indicate loss of fluid.

8-3* Electrical Service.

8-3.1 All wiring shall conform to NFPA 70, *National Electrical Code*.

8-3.2 Service equipment supplying the main power requirements of the computer area shall be of a type arranged for remote control or located to fulfill the requirements of Section 8-4.

8-3.3* Premise transformers installed in the computer area shall be of the dry type or type filled with a nonflammable dielectric medium. Such transformers shall be installed in accordance with the requirements of NFPA 70, *National Electrical Code*.

8-3.4 Service entrance transformers shall not be permitted in the electronic computer area.

8-3.5* Protection against lightning surges shall be provided in accordance with the requirements of NFPA 70, *National Electrical Code*.

8-3.6* Junction boxes shall be approved, completely enclosed, easily accessible, and properly grounded. They shall be securely fastened. No splices or connections shall be made in the underfloor area except within junction boxes or approved-type receptacles and connectors.

8-3.7 Emergency lighting shall be provided in the computer area.

8-4 Emergency Power Controls. An emergency disconnect accessible to the operator at each principal exit door shall be provided. These disconnects shall shut off power to all electronic equipment in the computer room.

8-4.1 An emergency disconnect accessible to the operator at each principal exit door shall be provided. These disconnects shall shut off power to the air conditioning system serving the computer area.

Chapter 9 Emergency and Recovery Procedures

9-1* There shall be a management-approved written, dated, and annually tested emergency fire plan.

9-2* There shall be a management-approved written, dated, and annually tested damage control plan.

9-3* There shall be a management-approved written, dated, and annually tested plan covering recovery procedures for continued operations.

Chapter 10 Electrical†

NOTE: The text of Chapter 10 was extracted from NFPA 70, Article 645. Only editorial changes were made to make the text consistent with this standard.

10-1 [645-1] General. This chapter covers equipment, power-supply wiring, equipment interconnecting wiring, and grounding of electronic computer/data processing equipment and systems, including terminal units, in the computer area.

10-2 [645-5] Supply Circuits and Interconnecting Cables.

10-2.1 [645-5(a)] 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.

10-2.2 [645-5(b)] Connecting Cables. The data processing system shall be permitted to be connected to a branch circuit by any of the following means listed for the purpose:

(a) Computer/data processing cable and attachment plug cap.

(b) Flexible cord and an attachment plug cap.

(c) Cord-set assembly. Where run on the surface of the floor, they shall be protected against physical damage.

10-2.3 [645-5(c)] Interconnecting Cables. Separate data processing units 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.

10-2.4* [645-5(d)] Under Raised Floors. Power cables, communications cables, connecting cables, interconnecting cables, and receptacles associated with the data processing equipment shall be permitted under a raised floor provided:

(a) The raised floor is of suitable construction and the area under the floor is accessible.

(b) 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, metal wireway, surface metal raceway with metal cover, flexible metal conduit, liquidtight flexible metal or 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, Section 300-11.

(c) Ventilation in the underfloor area is used for the data processing equipment and data processing area only.

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

(e) Cables, other than those covered in (b) above, shall be listed as Type DP cable having adequate fire-resistance characteristics suitable for use under raised floors of a computer room. This listing requirement shall become effective July 1, 1994.

Exception No. 1: Where the interconnecting cables are enclosed in conduit or raceway.

Exception No. 2: Interconnecting cables listed with equipment manufactured prior to July 1, 1994 shall be permitted to be reinstated with that equipment.

Exception No. 3: Other cable type designations that satisfy the above requirement are Type TC (NFPA 70 Article 340); Types CL2, CL3, and PLTC (NFPA 70 Article 725); Type FPL (NFPA 70 Article 760); Types OFC and OFN (NFPA 70 Article 770); Types CM and MP (NFPA 70 Article 800); Type CATV (NFPA 70 Article 820). These designations shall be permitted to have an additional letter P or R.

10-2.5 [645-5(e)] 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, electronic computer/data processing equipment shall not be required to be secured in place.

10-3* [645-6] Cables Not in Computer Area. Cables extending beyond the computer area shall be subject to the applicable requirements of the *National Electrical Code*.

10-4 [645-10] Disconnecting Means. A means shall be provided to disconnect power to all electronic equipment in the electronic computer/data processing equipment room and area. There shall also be a similar means to disconnect the power to all dedicated HVAC systems serving the room and area 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 (*see Section 8-4*).

Exception: Installations qualifying under the provisions of NFPA 70, Article 685.

10-5 [645-11] Uninterruptible Power Supplies (UPS). UPS systems installed within the electronic computer/data processing area, and their supply and output circuits, shall comply with Section 10-4. The disconnecting means shall also disconnect the battery from its load.

Exception No. 1: Installations qualifying under the provisions of NFPA 70, Article 685.

Exception No. 2: A disconnecting means complying with Section 10-4 shall not be required for power sources capable of supplying 750 volt-amperes or less derived from UPS equipment or from battery circuits integral to electronic equipment, provided all other requirements of Section 10-5 are met.

10-6* [645-15] Grounding. All exposed noncurrent-carrying metal parts of an electronic computer/data processing system shall be grounded in accordance with NFPA 70, Article 250 or shall be double-insulated. Power systems derived within listed electronic computer/data processing equipment that supply electronic computer/data processing 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 250-5(d).

10-7 [645-16] Marking. Each unit of an electronic computer/data processing 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.

Chapter 11 Referenced Publications

11-1 The following documents or portions thereof are referenced within this standard and shall be considered part of the requirements of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

11-1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 10, *Standard for Portable Fire Extinguishers*, 1990 edition

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*, 1989 edition

NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems*, 1992 edition

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 1991 edition

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*, 1990 edition

NFPA 70, *National Electrical Code*, 1993 edition

NFPA 72E, *Standard on Automatic Fire Detectors*, 1990 edition

NFPA 220, *Standard on Types of Building Construction*, 1992 edition

NFPA 232, *Standard for the Protection of Records*, 1991 edition

NFPA 253, *Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source*, 1990 edition

NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, 1990 edition

11-1.2 Other Publications.

11-1.2.1 ASTM Publications. American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19105.

ASTM E136-1982, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*

ASTM E814-1988, *Standard Method of Fire Tests of Through-Penetration Fire Stops*

11-1.2.2 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.

UL 478-84, *Standard for Safety Information-Processing and Business Equipment*

UL 1950-89, *Standard for Safety Information Technology Equipment Including Electrical Business Equipment*

Appendix A

This Appendix is not a part of the requirements of this NFPA document but is included for information purposes only.

A-1-2 This standard does not cover installation of electronic computer/data processing equipment and areas that can be made without special construction or protection. It may, however, be used as a management guide for the installation of electrically powered mechanical data processing equipment, small tabletop or desk-type units, and electronic computer/data processing equipment.

The strategic importance placed upon electronic computer/data processing 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" electronic computer/data processing 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-2-1 Risk Considerations. Electronic computer/data processing 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 may spell the difference between profit and loss, success or failure, life or death. To keep track of all these variables, electronic computer/data processing equipment offers practical answers.

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.

Risk considerations include the selection of proper equipment, checking and planning for areas to receive the equipment, utility requirements, 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, i.e., sabotage and incendiary.

Computer equipment and materials for data recording and storage may incur damage when exposed to elevated sustained ambient temperatures. The degree of such damage will vary depending upon exposure, equipment design, and the composition of materials for data recording and storage.

Business Interruption. Planning for fire protection is vital due to an organization's dependence upon the electronic computer/data processing equipment. Once management commits itself to a program of dependence on any such equipment, simple economics dictate doing away with former methods and procedures. The personnel, equipment, and facilities are no longer available to pick up the load assumed by the data processing equipment if it is put out of operation by fire or other unforeseen occurrences.

Often, the major cost involved to management by disruption of the computer operation is from business interruption rather than from the actual monetary loss represented by the equipment itself, although the latter may run into millions of dollars.

There are three major areas where a decision will be required. They are:

(a) Is this equipment important?

This is an evaluation based on both what the equipment is and what it does. If it controls air traffic safety it can be vital to human life; if it controls corporate information it can be vital to business "life."

(b) Does this equipment need special construction or environment?

When the equipment or the activity it supports is governed by this standard, the areas considered should include fire detection, fire extinguishment, and building construction.

(c) What is the exposure to the equipment?

Exposure to damage or destruction to the equipment can come from within a computer cabinet, from within the equipment room, from the immediate area around the data processing room, from the floors above and below the computer, and from outside of the building in which the equipment is located. This exposure should be evaluated and then controlled as needed.

The application of this standard to the protection of an individual system will depend upon the answers to these three questions.

While this standard cannot cover all contingencies, it gives an indication of the major areas of consideration and provides a basis for an intelligent evaluation of fire protection requirements. There is no substitute for informed consideration of commonsense principles.

Temperature Considerations. The following are guidelines concerning sustained high ambient temperatures:

(a) Damage to functioning computer equipment may begin at a sustained ambient temperature of 175°F (79.4°C), with the degree of damage increasing with further elevations of the ambient temperature and exposure time.

(b) Damage to magnetic tapes, flexible discs, and similar media may begin at sustained ambient temperatures above 100°F (37.8°C). However, damages occurring between 100°F (37.8°C) and 120°F (48.9°C) can generally be reconditioned successfully, whereas the chance of successful reconditioning lessens rapidly with elevations of sustained ambient temperatures above 120°F (48.9°C).

(c) Damage to disc media may begin at sustained ambient temperatures above 150°F (65.6°C), with the degree of damage increasing rapidly with further elevations of sustained ambient temperature.

(d) Damage to paper products (including punched cards) may begin at a sustained ambient temperature of 350°F (176.7°C). Paper products that have not become brittle will generally be salvageable.

(e) Damage to microfilm may begin at a sustained ambient temperature of 225°F (107.2°C) in the presence of steam or at 500°F (260°C) in the absence of steam.

A-3-1 The structural floor supporting the computer area should have sufficient floor loading capacity to sustain the expected floor load.

A-3-1.2 NFPA 80A, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures,* is one method of providing exposure protection.

A-3-1.3 Experience with fires affecting computer rooms has demonstrated that the fire often starts in areas other than the computer area and that the fire and its related products including smoke, soot, and heat can enter the computer room if it is not adequately separated by sealed rated walls. Consideration should be given to raising the rating of perimeter walls to two hours where adjacent walls are already rated two hours or greater.

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

A-3-2 Security. Many computer and data processing 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-3-2.1 Steam, water, or horizontal drain piping should not be in the space above the suspended ceiling and over computer equipment other than for sprinkler system use.

The electronic computer 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 a computer area. If computers must be located in a basement, precautions should be taken to facilitate smoke venting and prevent flooding from interior and exterior sources that may occur, including a fire on an upper floor.

A-3-3.1 Fire protection authorities generally prefer that hard-surfaced materials be used on computer room floors, and object to most carpeting. Because of the need in some computer rooms for special floor coverings, a useful guide for selection is the Underwriters Laboratories Inc. *Standard Method of Test for Flame-Propagation Classification of Flooring and Floor Covering Materials* (Subj. 992) or NFPA 253, *Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.*

A-3-3.2 In multistoried buildings, the floor above the computer 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. This is 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 leak detection when any utility or computer auxiliary cooling fluids are piped into the computer room or are capable of entering the room from adjoining areas.

A-3-4 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-3-4.4 Openings in raised floors for electric cables or other uses should be protected to minimize the entrance of debris or other combustibles beneath the floor.

A-4-1.1 Support equipment such as high-speed printers that utilize large quantities of combustible materials should be located outside of the computer room whenever possible.

A-4-2.4 Abandoned cable will potentially interfere with airflow and extinguishing systems. Abandoned cable also adds to the fuel loading.

A-5-1.3 All nonelectrical parts, such as housings, frames, supporting members, and the like, should not constitute additional fire hazard to the equipment.

A-5-2.1 Cables that are listed as part of an electronic computer/data processing equipment system may not carry a separate listing mark on the cable.

A-6-1 Automatic sprinkler systems protecting computer rooms or computer areas should be maintained in accordance with NFPA 13A, *Recommended Practice for the Inspection, Testing and Maintenance of Sprinkler Systems*. 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 8-4. In other instances when a fire may 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.

A-6-1.4 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 must 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 27 cu ft of combustibles storage space or less need not be provided with protection within the unit. The 27 cu ft volume assumes that no single dimension is larger than 3 ft (e.g., 3 ft × 3 ft × 3 ft).

A-6-2 Fire detection and extinguishing systems shall be selected after a complete evaluation of the exposures. The amount of protection provided shall be related to the building construction and contents, equipment construction, business interruption, exposure, and security need.

NOTE: For amplification of the important need of fire protection, see Chapter 2.

A-6-2.1 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-6-4.1 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 computer area, or the use of leased facilities, automatic gaseous agent total flooding may 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 (e.g., damper closure, fan shutdown, sealed openings, etc.) be carefully maintained to ensure that the needed concentration for extinguishment will be achieved.

A-6-4.2 The gaseous extinguishing system may be actuated by the automatic fire detection system required in Section 6-2 when designed to do so.

A-6-4.3 This requires that all environmental design criteria (e.g., damper closure, fan shutdown, sealed openings, etc.) be carefully maintained to ensure that needed concentration for extinguishment will be achieved. It is preferable but not essential to de-energize computer equipment prior to discharge if computer shutdown does not cause major service interruptions.

A-7-1.2 The evaluation of records should be a joint effort of all parties concerned with the safeguarding of computer operations. The amount of protection provided for any record should be directly related to its importance in terms of the mission of the computer system and the reestablishment of operations after a fire.

NOTE: It is assumed that computer equipment capable of properly using the records will be available. (*See Chapter 9.*)

A-7-2.1 The size of record storage rooms should be determined by an engineering evaluation of the operation, followed by the application of sound fire protection engineering principles. The evaluation should include, but not be limited to:

(a) Classification of records.

(b) Quantity of plastic-based records and type of container.

(c) Type and capacity of fire suppression system.

(d) Venting available for removal of products of combustion.

(e) Type and arrangement of fire detection system.

(f) Building construction materials.

A-8-1.4 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 may accumulate on the heating elements and, when the elements are energized, may 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 and maintain these reheat units in a clean condition.

A-8-3 The requirements in this section apply to all power and service wiring supplying the electronic computer equipment. The requirements of Section 8-3 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 5.

A-8-3.3 It is recommended that premise transformers not be installed in the computer area.

A-8-3.5 Besides providing protection against lightning surges as required in NFPA 70, *National Electrical Code*, it is recommended that the building housing a computer area be protected against lightning in accordance with NFPA 780, *Lightning Protection Code*.

A-8.3.6 The number of junction boxes in underfloor areas should be kept to a minimum.

A-9-1 A written emergency fire plan should be prepared for and posted at each installation that assigns specific responsibilities to designated personnel. Personnel should receive continuing instructions in at least the following:

(a) The method of turning off all electrical power to:

(1) The computers under both normal and emergency conditions and

(2) The air conditioning systems serving the area.

(b) Alerting the fire department or fire brigade.

(c) Evacuation of personnel and designated assembly area.

(d) The operations of all fire extinguishing and damage control equipment including automatic detection equipment.

(e) The use of extinguishers through actual operation on a practice fire.

A-9-2 Damage Control Plan. A damage control plan should provide a means for at least the following:

(a) Preventing or minimizing damage to electronic equipment.

(b) 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 may 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-9-3 Emergency and Recovery Procedures for Continued Operation. Emergency procedures for the continued operation of an electronic computer system should include but not be limited to the following:

(a) A program to protect records in accordance with their importance as set forth by Chapter 7.

(b) An analysis of the workload and its effect upon continuity of operations.

(c) A written set of requirements for the backup site, including:

(1) Backup files and equipment required.

(2) Configuration of mainframe computer and peripheral units.

(3) Alternate locations for backup processing.

(4) Availability of backup system.

(5) Telecommunications required at backup site.

(6) Files, input work, special forms, etc., needed.

(7) Personnel staffing and transportation.

(8) Agreements and procedures for the emergency use of computer equipment at a contingency site.

A-10.2.4 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 the *Standard for Electrical Wires, Cables, and Flexible Cords*, ANSI/UL 1581-1985.

Another method of defining fire resistance is for the damage (char length) not to exceed 4 ft 11 in. (1.5 m) when performing the CSA "Vertical Flame Test — Cables in Cable Trays," as described in *Test Methods for Electrical Wires and Cables*, CSA C22.2 No. 0.3-M-1985.

A-10-3 For signaling circuits, refer to NFPA 70, Article 725; for fiber optic circuits, refer to NFPA 70, Article 770; and for communication circuits, refer to NFPA 70, Article 800. For fire protective signaling systems, refer to NFPA 70, Article 760.

A-10-6 Where isolated grounding-type receptacles are used, see NFPA 70, Section 250-74, Exception No. 4.

This listed equipment provides the bonding and grounding requirements in accordance with the intent of NFPA 70, Article 250.

Appendix B Example of a Computer Area

This Appendix is not a part of the requirements of this NFPA document but is included for information purposes only.

The rooms shown in Figure B-1 are symbolic and do not denote size, shape, or location, nor are the rooms in Figure B-1 necessarily required in the computer area (*see definition of Computer Area*).

Supervisor and maintenance rooms normally are adjacent to and have direct access to the computer room. Computer rooms normally have a raised floor. (*See Figure B-1.*)

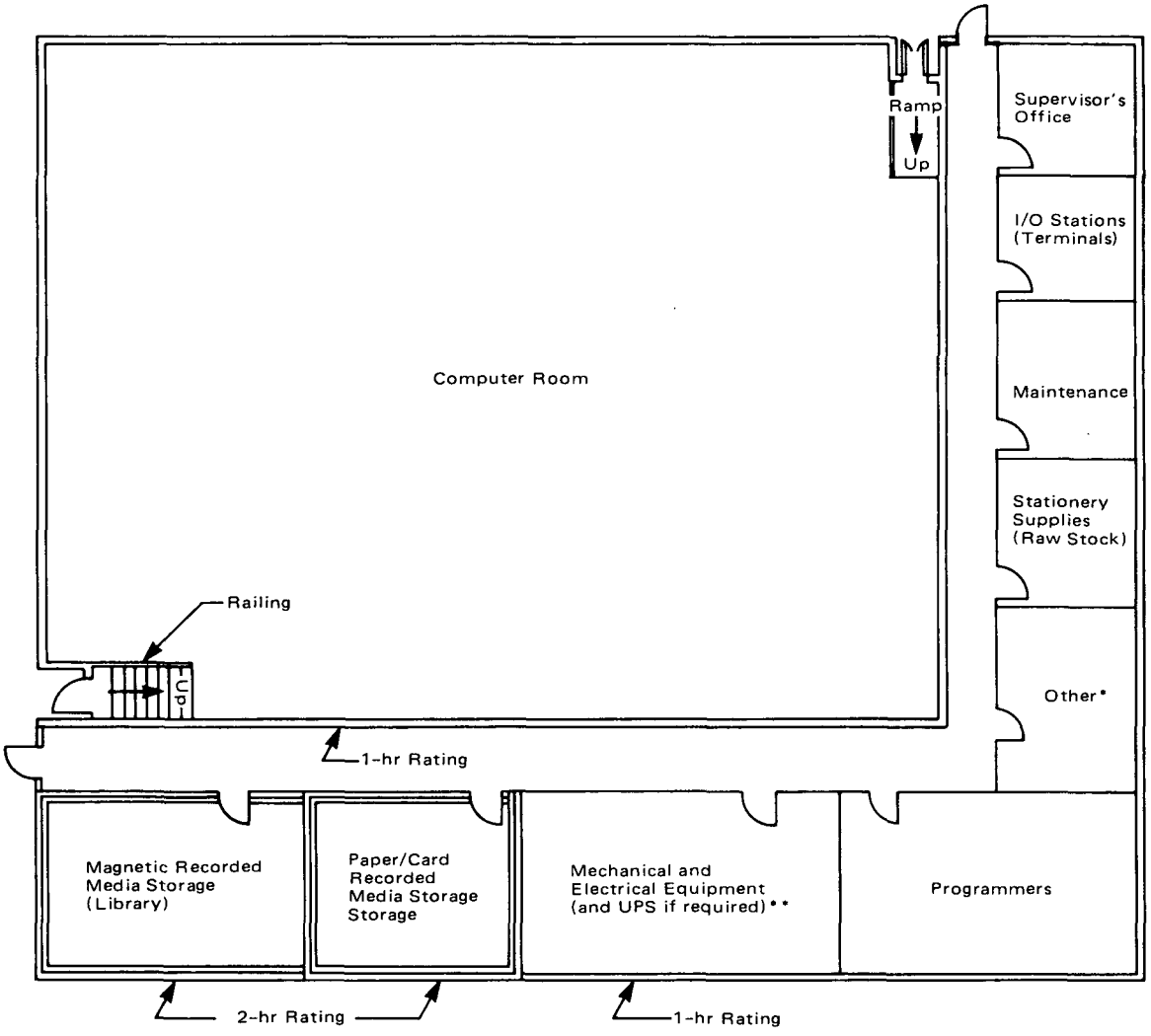
Appendix C

The following was extracted from the Blackmon-Mooring-Steamatic Publication "Electronics & Magnetic Media Recovery" (see D-1.2.3).

What to Do in the First 24 Hours

for Damaged Electronic Equipment and Magnetic Media

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.



*Other: Security Station. Communications, Control Rooms
**UPS: Uninterruptable Power Supply (Motor/Generator or Solid State Systems)

Figure B-1 Diagram of computer area.

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.

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.

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.

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.

Appendix D Referenced Publications

D-1 The following documents or portions thereof are referenced within this standard for informational purposes only and thus are not considered part of the requirements of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

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

NFPA 13A, *Recommended Practice for the Inspection, Testing and Maintenance of Sprinkler Systems*, 1987 edition

NFPA 70, *National Electrical Code*, 1993 edition

NFPA 80A, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures*, 1987 edition

NFPA 253, *Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source*, 1990 edition

NFPA 780, *Lightning Protection Code*, 1992 edition

D-1.2 Other Publications.

D-1.2.1 CSA Publication. Canadian Standards Association, 178 Rexdale Blvd., Rexdale, Ontario, Canada M9W-1R3.

CSA C22.2, *Test Methods for Electrical Wires and Cables*

D-1.2.2 DOE Publication. U.S. Dept. of Energy, EH-34, Washington, DC 20545.

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

D-1.2.3 UL Publication. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.

Standard Method of Test for Flame-Propagation Classification of Flooring and Floor Covering Materials

ANSI/UL 1581-1985, *Standard for Electrical Wires, Cables, and Flexible Cords*

D-1.2.4 Other Publication. Appendix C was extracted from: *Electronics and Magnetic Media Recovery,* Blackmon-Mooring-Steamatic Catastrophe, Inc., International Headquarters, 303 Arthur, Fort Worth, TX 76107, (817) 332-2770, FAX (817) 332-6728.

Index

The NFPA Codes and Standards Development Process

Since 1896, one of the primary purposes of the NFPA has been to develop and update the standards covering all areas of fire safety.

Calls for Proposals
The code adoption process takes place twice each year and begins with a call for proposals from the public to amend existing codes and standards or to develop the content of new fire safety documents.

Report on Proposals
Upon receipt of public proposals, the technical committee members meet to review, consider, and act on the proposals. The public proposals – together with the committee action on each proposal and committee-generated proposals – are published in the NFPA's Report on Proposals (ROP). The ROP is then subject to public review and comment.

Report on Comments
These public comments are considered and acted upon by the appropriate technical committees. All public comments – together with the committee action on each comment – are published as the Committee's supplementary report in the NFPA's Report on Comments (ROC).

The committee's report and supplementary report are then presented for adoption and open debate at either of NFPA's semi-annual meetings held throughout the United States and Canada.

Association Action
The Association meeting may, subject to review and issuance by the NFPA Standards Council, (a) adopt a report as published, (b) adopt a report as amended, contingent upon subsequent approval by the committee, (c) return a report to committee for further study, and (d) return a portion of a report to committee.

Standards Council Action
The Standards Council will make a judgement on whether or not to issue an NFPA document based upon the entire record before the Council, including the vote taken at the Association meeting on the technical committee's report.

Voting Procedures
Voting at an NFPA Annual or Fall Meeting is restricted to members of record for 180 days prior to the opening of the first general session of the meeting, except that individuals who join the Association at an Annual or Fall Meeting are entitled to vote at the next Fall or Annual Meeting.

"Members" are defined by Article 3.2 of the Bylaws as individuals, firms, corporations, trade or professional associations, institutes, fire departments, fire brigades, and other public or private agencies desiring to advance the purposes of the Association. Each member shall have one vote in the affairs of the Association. Under Article 4.5 of the Bylaws, the vote of such a member shall be cast by that member individually or by an employee designated in writing by the member of record who has registered for the meeting. Such a designated person shall not be eligible to represent more than one voting privilege on each issue, nor cast more than one vote on each issue.

Any member who wishes to designate an employee to cast that member's vote at an Association meeting in place of that member must provide that employee with written authorization to represent the member at the meeting. The authorization must be on company letterhead signed by the member of record, with the membership number indicated, and the authorization must be recorded with the President of NFPA or his designee before the start of the opening general session of the Meeting. That employee, irrespective of his or her own personal membership status, shall be privileged to cast only one vote on each issue before the Association.