ANSI/NFPA 232 An American National Standard December 10, 1985

NFPA 232 Protection of Records 1986

National Fire Protection Association Batterymarch Park, Quincy, MA 02269

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For information on the procedures for requesting Technical Committees to issue Formal Interpretations, proposing Tentative Interim Amendments, proposing amendments for Committee consideration, and appeals on matters relating to the content of the document, write to the Secretary, Standards Council, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

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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.

Statement on NFPA Procedures

This material has been developed under the published procedures of the National Fire Protection Association, which are designed to assure the appointment of technically competent Committees having balanced representation. While these procedures assure the highest degree of care, neither the National Fire Protection Association, its members, nor those participating in its activities accepts any liability resulting from compliance or noncompliance with the provisions given herein, for any restrictions imposed on materials or processes, or for the completeness of the text.

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NFPA 232

Standard for the

Protection of Records

1986 Edition

This edition of NFPA 232, *Standard for the Protection of Records*, was prepared by the Technical Committee on Record Protection, released by the Correlating Committee on Storage, and acted on by the National Fire Protection Association, Inc. at its Fall Meeting held November 18-20, 1985 in Baltimore, Maryland. It was issued by the Standards Council on December 10, 1985, with an effective date of December 30, 1985, and supersedes all previous editions.

The 1986 edition of this standard has been approved by the American National Standards Institute.

Changes other than editorial are indicated by a vertical rule in the margin of the pages on which they appear. These lines are included as an aid to the user in identifying changes from the previous edition.

Origin and Development of NFPA 232

The destructive fire in the general offices of the Chicago, Burlington and Quincy Railway, Chicago, on March 25, 1922, was definite proof that valuable and often irreplaceable business records, unless properly protected, can be destroyed even in so-called "fire-resistive" buildings. Following this destructive fire in 1922, the Committee on Protection of Records was organized. Reports were submitted annually from 1923 through 1936, and in 1939. In 1947, a separate pamphlet was prepared from the officially adopted committee reports of 1942 to 1946. In 1960 the standard underwent a major editorial revision and was revised again in 1963, 1967, and 1970. In 1975 it was reconfirmed. The 1980 edition arranged the standard in the format of the NFPA style manual and changed the requirements to be performance oriented rather than detail specifications. The 1986 edition is a reconfirmation of the 1980 edition and includes updates primarily to the reference publications chapters.

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This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred.

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 232

Standard for the

Protection of Records

1986 Edition

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 6 and Appendix B.

Chapter 1* Introduction

1-1 Scope. This standard provides requirements for records protection equipment, facilities, and records handling techniques that provide protection from the hazards of fire. It does not consider forcible entry.

1-1.1 Because of the volume of records, this standard does not cover large archives or records storage buildings. (*See NFPA 232AM, Manual for Fire Protection for Archives and Records Centers.*)

1-1.2 This standard does not cover the storage and handling of cellulose nitrate film records. (*See NFPA 40, Standard for the Storage and Handling of Cellulose Nitrate Motion Picture Film.*)

1-2 Purpose. This standard is prepared for the use and guidance of those charged with purchasing, designing, constructing, installing, inspecting, approving, listing, operating, or maintaining equipment and facilities to protect records against fire and its associated effects.

This standard is also for the use and guidance of those charged with planning, surveying, classifying, retaining, disposing, and otherwise handling records.

1-3 Planning. It may be necessary for many of those charged with planning, inspecting, approving, operating, and maintaining records facilities, equipment and techniques to consult with an experienced and competent fire protection engineer or records protection consultant.

1-4 Equivalency Concepts. Nothing in this standard is intended to prevent the use of buildings, systems, methods, or devices that provide a level of fire safety of records equivalent to that prescribed herein. Any building, system, method or device different from those detailed in this standard may be examined and/or tested by the authority having jurisdiction according to the intent of this standard and, if found equivalent, may be approved.

1-5 Provisions in Excess of Requirements. Nothing in this standard shall be construed to prohibit better or safer conditions than the requirements specified in this standard.

1-6 Definitions. Unless expressly stated elsewhere, the following terms will, for the purpose of this standard, have the meanings indicated as follows:

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."

File Room. A file room is a fire-resistive enclosure which provides less fire protection than a vault and is used exclusively for the storage of records.

File Room Door. A file room door is an approved assembly which will protect paper records against fire for its rated exposure.

Fire-Resistive Building.* A fire-resistive building is one of Type I or Type II-222 construction (*See Table 3 of NFPA 220, Standard on Types of Building Construction*) in which the structural members including walls, partitions, columns, floors, and roofs are of noncombustible or limited combustible materials.

Mobile Shelving. A system of records storage in which sections or rows of shelves are moved on tracks to provide access aisles. Also called track files, compaction files, moveable files. May be moved manually or electrically. Mobile shelving is a type of open-shelf file equipment.

Nonfire-Resistive Building. A nonfire-resistive building is one of that type of construction in which the structural members, including walls, partitions, columns, floors, and roofs, do not qualify as fire-resistive as defined herein.

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 equipment 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.

Open-Shelf File Equipment. Any shelving that does not enclose file compartments on six sides.

Records Classes.

(a) Vital records are those which 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, and raw materials, finished goods and work in process; and records needed to avoid delay in restoration of production, sales and service.

(b) Important records are those of which a reproduction could be obtained only at considerable expense and labor or only after considerable delay.

Shall. Indicates a mandatory requirement.

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

Slab. A poured concrete floor-ceiling assembly.

Standard Records Vault. A completely fire-resistive enclosure, used exclusively for records storage.

(a) *Ground-supported Vault.* A vault that is supported from the ground up and structurally independent of the building in which it is located.

(b) *Structure-supported Vault.* A vault supported by the framework of a fire-resistive building and may be supported individually on any floor of such a building.

Vault Door. An approved assembly that will protect paper records against fire for its rated exposure.

Vault Floor. The ground-supported slab or the slab between vaults in a tier.

Vault Roof. The ceiling or roof of a single vault and the ceiling or roof of the top vault of a tier, but not the slab between vaults in a tier, which is classified as a floor.

Chapter 2 Standard Records Vault

2-1 General.

2-1.1 The vault shall be equipped, maintained, and supervised so as to minimize the possibility of origin of fire within and to prevent entrance of fire from without for a specified period of time.

2-1.2 To resist the maximum expected exposure fire, a vault shall be constructed as specified herein and in accordance with the ratings in Chapter 5.

2-2 Design.

2-2.1 In a fire-resistive building, the vault may be of either the ground-supported or the structure-supported type.

2-2.2 In a nonfire-resistive building, the vaults shall be of the ground-supported type. Walls of a building shall not be used as walls of vault because collapse of the building may cause damage to the vault and its contents.

2-2.3 Plans and specifications shall be prepared and construction supervised by a licensed structural engineer or architect.

NOTE: Vaults require unusually good design and construction to ensure that the structure will satisfactorily withstand all of the conditions that may be imposed upon it by fire.

2-2.4 Proper design and construction of a vault shall consider its qualities as a flame barrier and as a heat-retardant, its ability to avoid settlement and consequent cracking, and its ability to maintain the integrity of the vault structure under the stresses and impacts to which it may be subjected during a fire, including impact from falling objects and stresses; strains and erosion due to sudden cooling with fire hose streams.

2-3 Location. Because of the difficulty of providing resistance to severe impact, vaults in non fire-resistive buildings shall be located where they will not be exposed to the fall of a heavy object such as a safe, machine, or water tank, in the event of collapse of the building as the result of a fire.

NOTE: Vaults below grade are undesirable, because under certain conditions sufficient burning or smoldering debris may be accumulated in a basement to produce a "cooking effect" of such duration that the effects of combustion cannot be resisted by construction alone (within practical limitations). Also, vaults located below grade may be damp, causing destruction of records by the formation of mold and may be subject to flooding under either flood or fire conditions, with consequent damage to records.

2-4 Size. For the purpose of restricting the quantity of vital records exposed to destruction by fire in a single enclosure and to reduce the possibility of fire originating within the vault, a vault shall not exceed 5,000 cu ft (142 m^3) in volume and the interior height shall not exceed 12 ft (3.7 m).

NOTE: For conditions requiring storage of a larger volume of vital records, see Section 2-14 and 3-1.5.

2-5 Foundations.

2-5.1 Ground-supported Vaults. Foundations for

vaults shall carry the entire load of the vault or tier of vaults and contents without settlement or cracking. Unburied structural members supporting vaults shall have fire resistance at least equal to that of the vault.

2-5.2 Structure-supported Vaults.

2-5.2.1 The supporting structures for vaults shall be of adequate strength to carry the full load, including the weight of the vault structure and its contents (wet weight).

NOTE: The wet weight of records is approximately 2.4 times the dry weight. Correspondence files (dry) weigh approximately 30 lb per cu ft (480 kg/m³).

2-5.2.2 There shall be no combustible material in any portion of the building members which support the vault. All building structural members that support the vault shall have fire resistance at least equal to that of the vault.

2-5.2.3 The walls of a structure-supported vault shall follow the column lines of the building wherever possible and shall extend from slab to slab in each story where a vault is located. If vaults are located on more than one floor of a building, they shall be placed preferably one above the other in the several stories.

2-6 Floor.

2-6.1 Floors shall be noncombustible and have floor surfacing limited to concrete sealer.

2-6.2 In structure-supported vaults the floor of the fire-resistive building may serve for the floor of the vault, provided it is of noncombustible construction throughout and complies with the following requirements:

(a) Floors above grade shall be adequate to support the full load (wet weight), and have unrestrained fire resistance equivalent to that required for the walls of the vault. (*See Section 2-7.*)

(b) Floors above grade shall not be pierced for any purpose.

2-7 Walls.

2-7.1 Walls shall be noncombustible and of fire-resistive construction throughout.

2-7.2 Reinforcing rods in concrete shall be so located as to avoid failure from fire exposure.

2-7.3 Noncombustible material shall be used for trim or partitions.

2-7.4 The design shall provide the necessary minimum resistance to fire and fire hose streams, for structural consideration and variations in quality of materials and workmanship. Walls shall have sufficient lateral strength to withstand impact due to collapsing structural members, toppling machinery, and/or building equipment.

NOTE: Traditionally recognized construction meeting these requirements is as follows:

(a) Reinforced concrete with steel rods at least ½ in. (13 mm) in diameter spaced 6 in. (152 mm) on center and running at right angles in both directions. Rods are securely wired at intersections not over 12 in. (305 mm) apart in both directions, and installed centrally in the wall or panel.

(b) A structural steel frame protected with at least 4 in. (102 mm) of concrete, brickwork, or its equivalent tied with steel ties or wire mesh equivalent to No. 8 ASW gage wire on 8 in. (203 mm) pitch. Any brick protection used is filled solidly to the steel with concrete.

(c) Fire resistance is determined by wall thickness as follows:

1. Minimum thickness of a 4-hr vault wall is 12 in. (305 mm) for brick and 8 in. (203 mm) for reinforced concrete.

2. Minimum thickness of a 6-hr vault wall is 12 in. (305 mm) for brick and 10 in. (254 mm) for reinforced concrete.

(d) Walls of ground-supported vaults are of greater thickness than those described herein where it is necessary to account for unusual structural conditions, loads, etc.

2-7.5 Openings in Walls.

2-7.5.1 Walls of vaults shall have no openings other than those necessary for access, electric lighting, power-limited circuits, and sprinkler piping. (*See 2-14.1.*)

2-7.5.2 Door openings shall be protected with approved vault doors. Doors shall not open into elevator, conveyor, or other shafts, and there shall be no openings from one vault into another.

2-7.5.3 Door openings shall not exceed two for any one vault and shall be limited in size to that necessary for convenient ingress and egress, and for ventilation.

2-7.5.4 Wall penetrations for electric lighting and limited energy circuits shall be as small as possible and shall be grouted, potted, or otherwise sealed for the thickness of the wall to prevent smoke, heat, flame, or water penetration. Conduit, if used, shall be sealed inside and outside.

2-7.5.5 Walls shall not be pierced for ventilation.

NOTE: Environmental requirements such as heating, cooling, humidity control, etc. may be provided by controlling the environment outside of the vault.

2-7.6 Bonding.

2-7.6.1 Vault walls of masonry units shall be laid with corners well bonded throughout their height.

2-7.6.2 Where the floor construction of a fire-resistive building forms the roof of the vault, the joint between the top of the vault wall and the underside of the floor arch or slab shall be tightly finished and thoroughly filled with mortar or cement grout.

2-7.6.3 If any wall of a building is of suitable construction to form part of the vault enclosure, the wall or walls of the vault at the intersection with the building wall shall, when practicable, be bonded and/or keyed into it for the full height and width of the vault wall or walls.

2-8 Independence from Building Structure.

2-8.1 Vault construction shall not be used as a support or bearing for the structural members of the building.

2-8.2 In ground-supported vaults the walls and supports of vaults shall be structurally independent of the building.

2-9 Roof.

2-9.1 In nonfire-resistive buildings, the roof of vaults shall be entirely independent of the wall, floor, ceiling, columns, piers, or roof construction of the building.

2-9.2 In structure-supported vaults the roof or the floor of the fire-resistive building may serve for the roof of the vault, provided it is of noncombustible construction throughout and complies with the following requirements:

(a) Roof of vault shall be reinforced concrete or reinforced concrete on protected steel supports.

(b) Roof of vault shall have fire resistance at least equal to that of the walls, and have structural strength adequate to carry the design load, greater if subject to unusual impact, or if exposed to fire from outside the vault.

(c) All interior supports shall have fire resistance equivalent to that of the walls.

(d) Roofs of vaults shall not be pierced for any purpose.

2-10* Vault Door.

2-10.1 Each wall opening in the vault shall be provided with a listed or labeled vault door tested in accordance with ANSI/UL 155. The vault door shall have a rating, in hours of fire-resistance, comparable to the classification of the walls of the vault, as follows:

4-hr vault	4-hr door
6-hr vault	6-hr door

NOTE: Ordinary fire doors such as hollow metal, tinclad, sheet metal, or metalclad types; steel plate type and file room doors are not acceptable as vault doors.

2-10.2 Installation of the vault door unit shall be made in conformity with instructions supplied by the manufacturer and shall be entrusted only to those experienced in such installation work.

2-10.3 The door-locking mechanism shall be of a type enabling a person accidentally locked inside the vault to open the door easily from the inside.

NOTE: Interior emergency lighting may be necessary.

2-10.4 Doors shall be equipped with an automatic closing device and a heat-actuated or smoke-actuated release to close them in case of fire.

2-11 Electrical Service.

2-11.1 All electrical service within the vault shall be in conduit and installed in accordance with NFPA 70, *National Electrical Code*.®

2-11.2 The wiring shall provide as many fixed lamps as needed for adequate illumination. There shall be no pendant lamp or extension cord used within a vault. Fixed lighting shall be adequate for illumination of all portions of the vault to preclude the use of matches or other hazardous lighting.

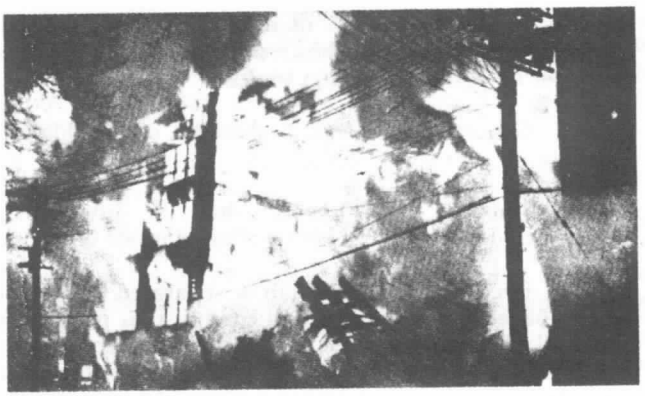

Figure 2-10.1(a) The 2-story vault [shown in Figure 2-10.1(b)] was in this sprinklered 4-story brick, plank-on-timber hardware factory in Syracuse (above). The $977,000 fire was detected by the watchman. After the fire of suspicious origin, sprinkler valves were found shut off.

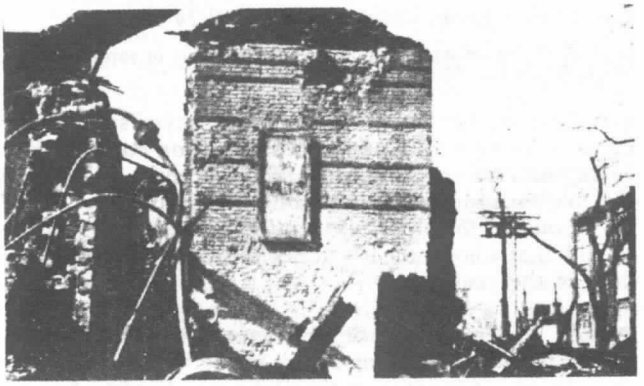

Figure 2-10.1(b) Satisfactory performance of a labeled vault door saved records in the upper story of this 2-story vault. A labeled fire door (not a vault door) at the first story level was damaged and records in the first story were destroyed. Figure 2-10.1(a) shows the fire exposure to vault.

2-11.3 Necessary lighting shall be limited to vaporproof or explosionproof lamps controlled by a 2-pole switch outside of the vault. No other electrical devices or appliances, other than low energy devices, shall be permitted within the vault.

2-12 Operating Practices.

2-12.1 Filing equipment shall be noncombustible throughout. All records shall be stored in fully enclosed noncombustible containers.

NOTE: For storage of records in open-type equipment see Chapter 3.

2-12.2 The records in the filing equipment shall be not less than 3 in. (76 mm) above the floor of the vault.

2-12.3 The vault shall be under responsible supervision from opening until closing time and inspections shall be made daily, particularly before closing time, to ensure that all containers are closed, no records left on top of containers or elsewhere exposed, all waste papers removed, and vault doors closed and locked.

2-12.4 Vaults shall not be used as working spaces. Persons other than those authorized to handle the records shall not be permitted in the vaults.

2-12.5 General housekeeping shall be of the highest order.

2-12.6 Smoking inside vaults shall be prohibited. Matches and lighters shall not be allowed inside of vaults.

2-12.7 Records containers shall be separated by at least 6 in. (152 mm) from piping and conduit that penetrates the wall. Where sprinklers are installed, records containers shall be kept 18 in. (457 mm) below sprinkler deflectors.

2-13 Fire Suppression and Signaling Equipment.

2-13.1 Other than power-limited circuits, automatic or manual fire protection devices shall be limited to those not requiring wall penetration.

Exception: Wall penetration for supplying automatic sprinklers is permissible (see Section 2-14 also).

NOTE: Sprinklers in file rooms on grade may be supplied by pipes that rise through the floor.

2-13.2 Portable fire extinguishers of a type suitable for Class A fires (*see NFPA 10, Standard for Portable Fire Extinguishers*), or standpipe systems with small hose suitable for use by occupants of the building (*see NFPA 14, Standard for Standpipe and Hose Systems*) shall be provided at a conveniently accessible location outside the door of the vault.

2-13.3 Where automatic fire detection systems are installed for giving warning of fire inside of the vault, they shall be in accordance with NFPA 71, *Central Station Signaling Systems*; NFPA 72A, *Local Protective Signaling Systems*; NFPA 72B, *Auxiliary Protective Signaling Systems*; NFPA 72C, *Remote Station Protective Signaling Systems*; or NFPA 72D, *Proprietary Protective Signaling Systems*; and NFPA 72E, *Automatic Fire Detectors*. The systems shall be relied upon only when there is assurance that the alarms will bring prompt response at all times.

2-14 Oversize Vault.

2-14.1* Where the volume of "vital" records exceeds that which can be stored in a record vault of maximum permissible size (5,000 cu ft [142 m^3]), they may be protected by providing an oversize vault of not over 25,000 cu ft (708 m^3) designed and constructed as a standard vault and equipped with automatic sprinkler protection installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

2-14.2 Filing equipment shall be noncombustible, but need not be totally enclosed. Where mobile shelving is used, smoke detection in accordance with 2-13.3 shall be provided in addition to automatic sprinklers.

Chapter 3 File Rooms and Open-Shelf File Rooms

3-1 General.

3-1.1 All records in file rooms shall be kept in noncombustible containers.

3-1.2 Various systems of filing in units that do not totally enclose the files provide inadequate protection for vital records and shall not be used in file rooms. The use of open-shelf files shall be limited to records other than vital. Requirements for open-shelf and mobile shelving file rooms shall be identical to those for file rooms, except where otherwise stated.

3-1.3 The file room shall be used exclusively for the storage and handling of records, and shall be so equipped, maintained, and supervised as to minimize the possibility of fire originating within and to prevent entrance of fire from outside the file room.

NOTE: The presence of filing personnel and processing operations within the file room, the additional hazards of lighting and heating equipment, and the greater volume of records likely to be exposed at one time add to the possibility of origin of fire and destruction of records within the enclosure.

3-1.4 To resist the maximum expected exposure fire, a file room shall be constructed as specified herein and according to the ratings in Chapter 5.

3-1.5 Where it is necessary to maintain vital records in a file room, they shall be kept in rated record protection equipment.

3-2 Design and Location.

3-2.1 Plans and specifications shall be prepared and construction supervised by a licensed structural engineer or architect.

3-2.2 Fire resistance ratings prescribed for file rooms shall be the time that materials or assemblies have withstood a fire exposure established in accordance with the test procedures of NFPA 251, *Standard Methods of Fire Tests of Building Construction and Materials*.

3-2.3* File rooms shall not be located below ground level.

3-2.4 File rooms shall be located above any anticipated flood level.

3-2.5 File rooms shall not be located so as to be subject to severe impact by a falling machine, safe, water tank, or other heavy object or structure.

3-3 Size. File rooms shall not exceed 50,000 cu ft (1 416 m^3) in volume, and the height shall not exceed 12 ft (3.7 m).

3-4 Supporting Structure.

3-4.1 The supporting structures for file rooms shall be of adequate strength to carry the full load including the weight of the file room structure and its contents (wet weight).

NOTE: The wet weight of records is approximately 2.4 times the dry weight. Correspondence files (dry) weigh approximately 30 lb per cu ft (480 kg/m³).

3-4.2 There shall be no combustible material in any portion of the building members that support the file room. All building structural members which support the file room shall have fire resistance at least equal to that of the file room.

3-4.3 The walls of a structure-supported file room shall follow the column lines of the building wherever possible and shall extend from floor to floor of the building in each story where a file room is located. If file rooms are located on more than one floor of a building, they shall preferably be placed one above the other in the several stories.

3-5 Floor.

3-5.1 In structure-supported file rooms the floor of the fire-resistive building may serve as the floor of the file room, provided it is of noncombustible construction throughout and complies with the following requirements:

(a) Floors above grade shall be adequate to support the full load (wet weight), and have unrestrained fire resistance equivalent to that required for the walls of the file room.

(b) Floors above grade shall not be pierced for any purpose.

3-5.2 Reinforcing rods in concrete shall be so located as to avoid failure from fire exposure.

3-6 Walls.

3-6.1 Walls shall be constructed of noncombustible or limited combustible materials.

3-6.2 Noncombustible material shall be used for trim or partitions within the file room.

3-6.3 Openings in Walls.

3-6.3.1 Walls of file rooms shall have no openings other than those necessary for access, electric lighting, power-limited circuits, sprinkler piping, and hot water or low pressure steam piping.

3-6.3.2 Door openings shall be protected with approved file room doors. Doors shall not open into elevator, conveyor, or other shafts.

3-6.3.3 Walls shall not be pierced for ventilation.

3-6.4 Bonding. If any wall of a building is of suitable construction to form part of the file room enclosure, the wall or walls of the file room at the intersection with the building wall shall, when practicable, be bonded into it for the full height and width of the file room wall or walls.

3-7 Roof.

3-7.1 In nonfire-resistive buildings, the roof of the file room shall be entirely independent of the wall, floor, ceiling, columns, piers, or roof construction of the building.

3-7.2 In fire-resistive buildings, the roof or the floor may serve as the roof of the file room, provided it is of limited combustible or noncombustible construction throughout and complies with the following requirements:

(a) Roof of file room shall be reinforced concrete or reinforced concrete on protected steel supports.

(b) Roof of file room shall have fire resistance at least equal to that of the walls, and have structural strength adequate to carry the design load, greater if subject to unusual impact or if exposed to fire from outside the file room.

(c) All interior supports shall have fire resistance equivalent to that of the walls.

(d) Roofs of file rooms shall not be pierced for any purpose.

3-8 File Room Door.

3-8.1 Each wall opening in the file room shall be provided with doors tested in accordance with ANSI/UL 155, Tests for Fire Resistance of Vault and File Storage Room Doors. The file room door shall have a rating, in hours of fire resistance, comparable to the classification of the walls of the file room, as follows:

6-hr file room — 6-hr door.
4-hr file room — 4-hr door.
2-hr file room — 2-hr door.
1-hr file room — 1-hr door.

3-8.2 Installation of the file room door unit shall be made in conformity with instructions supplied by the manufacturer and shall be entrusted only to those experienced in such installation work.

3-8.3 The door-locking mechanism shall be of a type enabling a person accidentally locked inside the file room to open the door from the inside.

3-8.4 Doors shall be equipped with an automatic closing device operated by a heat-actuated or smoke-actuated release.

3-9 Damp Proofing. When walls, floor, or roof of a file room are damp proofed, methods and materials used shall be such that the desired fire resistance of the file room shall not be impaired.

3-10 Electrical Service.

3-10.1 All electrical service within the file room shall be in conduit and installed in accordance with NFPA 70, *National Electrical Code*.

3-10.2 The wiring shall provide as many fixed lamps as needed for adequate illumination. There shall be no pendant lamp or extension cord used within a file room. Fixed lighting shall be adequate for all portions of the file room to preclude the use of matches or other hazardous lighting.

3-10.3 Necessary lighting shall be limited to vapor-proof or explosion-proof lamps controlled by a 2-pole switch equipped with a pilot light outside of the file room. No other electrical devices or appliances, other

than power limited circuits, shall be permitted within the file room.

3-11 Heating and Ventilation.

3-11.1 Heating shall be by hot water or steam. When steam heating is used, the coils or radiators shall be located to avoid the possibility of records coming in contact with them. Piping shall be placed overhead. Where the pipe is carried through the wall, the holes shall be made as small as practicable, the pipe provided with a close fitting noncombustible sleeve and the space around the inside of the sleeve completely filled with approved material. Floors, except slab on grade, and roofs of file rooms shall not be pierced for piping. No open-flame heaters, electrical heaters, etc., shall be used.

3-11.2 Ventilation of the interior shall be through a door opening.

NOTE: Where the natural circulation of air through the door opening does not provide sufficient ventilation, an electric fan may be placed close to the door, and directed through the door opening. Such fans may be conveniently mounted near the top of the door. Fans should be so located that they will not obstruct the closing of the door.

3-12 Operating Practices.

3-12.1 All records shall be stored in fully enclosed noncombustible containers.

NOTE: For storage of records in open type equipment see 3-1.2.

3-12.2 Records in the filing equipment shall be not less than 3 in. (76 mm) above the floor.

3-12.3 The file room shall be under responsible supervision from opening until closing time and inspections shall be made daily, particularly before closing time, to ensure that all containers are closed, no records are left on top of containers or elsewhere exposed, all waste papers are removed, and file room doors closed and locked.

3-12.4 File rooms shall not be used as working spaces. No work stations shall be permitted. Persons other than those authorized to handle records shall not be permitted in the file rooms.

3-12.5 General housekeeping shall be of the highest order.

3-12.6 Smoking inside file rooms shall be prohibited. Matches and lighters shall not be allowed inside file rooms.

3-12.7 Records containers shall be separated by at least 6 in. (152 mm) from piping and conduit which penetrates the wall. Where sprinklers are installed, records containers shall be kept 18 in. (457 m) below sprinkler deflectors.

3-13 Fire Suppression and Signaling Equipment.

3-13.1 Where an automatic fire extinguishing system is installed in a file room, such installation shall be made in accordance with the NFPA standard that applies to the type of system selected.

If automatic sprinklers are installed, conveniently located sprinkler alarms and shutoff valves outside the file room shall be provided to permit turning water off promptly after the fire is extinguished.

NOTE: Sprinklers in file rooms on grade may be supplied by pipes that rise through the floor.

3-13.2 Open-shelf file rooms shall be fully sprinklered in accordance with the provisions of NFPA 13, *Standard for Installation of Sprinkler Systems*, hydraulically designed for Ordinary Hazard (Group 3) occupancy.

3-13.3 Portable fire extinguishers of a type suitable for Class A fires (*see NFPA 10, Standard for Portable Fire Extinguishers*), or standpipe systems with small hose suitable for use by occupants of the building (*see NFPA 14, Standard for the Installation of Standpipe and Hose Systems*) shall be provided at a conveniently accessible location outside the file room.

3-13.4 Open-shelf file rooms having mobile shelving, which have concealed spaces more than 6 ft (1.8 m) wide, shall be equipped with a smoke detection system complying with NFPA 72E, *Standard on Automatic Fire Detectors*, connected to call the fire department when activated.

3-13.5 Where automatic fire detection systems are installed for giving warning of fire inside of the file room, they shall be in accordance with NFPA 71, *Standard for the Installation, Maintenance and Use of Central Station Signaling Systems*; NFPA 72A, *Standard for the Installation, Maintenance and Use of Local Protective Signaling Systems for Guard's Tour, Fire Alarm and Supervisory Service*; NFPA 72B, *Standard for the Installation, Maintenance and Use of Auxiliary Protective Signaling Systems*; NFPA 72C, *Standard for the Installation, Maintenance and Use of Remote Station Protective Signaling Systems*; or NFPA 72D, *Standard for the Installation, Maintenance and Use of Proprietary Protective Signaling Systems*; and NFPA 72E, *Standard on Automatic Fire Detectors*. The systems shall be relied upon only when there is assurance that the alarms will bring prompt response at all times.

Chapter 4 Records Protection Equipment

4-1* General. Records protection equipment is movable and includes fire-resistant safes and cabinets. These devices are intended to provide protection for various types of records for various durations of fire exposure, by segregating them from surrounding fire exposure.

4-2* Classificaton of Devices. Only listed or labeled records protection equipment shall be used.

NOTE: This equipment is tested in accordance with ANSI/UL 72, *Standard for Tests for Fire Resistance of Record Protection Equipment*.

4-3 Selection of Equipment.

4-3.1 The selection of the class of record protection equipment shall be based on the requirements herein and in Chapter 5.

4-3.2 The label on the device shall include the name of the equipment, the temperature rating, and the time rating. The label shall be applied to the equipment and be located so as to be readily visible after the equipment has been installed.

4-3.3* Cabinets made of wood, fiberboard, or other combustible materials shall not expose containers housing valuable records.

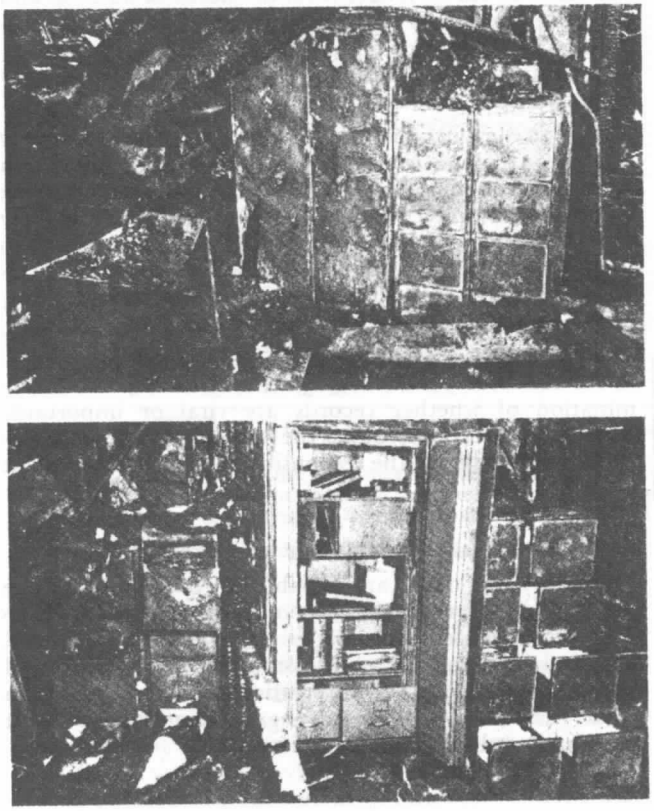

Figure 4-3.1 These two pictures of the same equipment show graphically the value of fire-rated containers for protection of records. These containers were in a 1-story brick and steel building destroyed by a 5-hr fire. The 1-hr rated equipment at the right and the 2-hr rated safe in the center protected their contents. Records in the non-rated equipment at left were destroyed.

Chapter 5 Preservation of Records

5-1 General.

5-1.1* The fire resistance requirements for vaults, file rooms, and records protection devices shall be in accordance with the type of construction (e.g.; fire-resistive or nonfire-resistive), the total combustibles exposing the vault, file room, or records protection device, and the records media being protected, as detailed in Chapters 2, 3, and 4.

NOTE: For guidance in protection of records other than vital or important see A-5-1.1.

5-1.2 Some records are better protected by duplication. Where this method is used, the duplicated records shall be stored in a separate location not subject to the same fire.

5-2 Fire-Resistive Buildings.

5-2.1 The devices required to adequately protect records in a fire resistive building shall be determined by:

(a) the total combustible contents per floor in the building, and

(b) the percentage of combustibles that are in an exposed position on any given floor. These conditions are summarized in Table 5-2.

Table 5-2
Equipment for a Fire-Resistive Building

Total Combustible Contents per Floor (Including any Combustible Flooring, Partitions and Trim), Lb Per Sq Ft of Floor Area *(See A-5.1.1(a)(7))*	Noncombustible Desks, Filing Cabinets, Lockers and Other Closed Containers. Not over 30 Percent of Combustibles Exposed	Combustible Desks, Filing Cabinets, Shelving, Containers, Etc.
Less than 5 lb	1-hr device (without impact) or file room	1-hr device (without impact) or file room
5 to 10 lb	1-hr device (without im-Pact) or file room	1-hr device (with impact) or file room
10 to 15 lb	1-hr device (without im-	2-hr device or file room
15 to 20 lb	1-hr device (with impact) or file room	2-hr device or file room
20 to 30 lb	1-hr device (with impact) or file room	4-hr device, file room or vault
30 to 35 lb	2-hr device or file room	4-hr device, file room, or vault
35 to 45 lb	2-hr device or file room,	6-hr vault or file room
45 to 50 lb	4-hr device, file room, or vault	6-hr vault or file room
50 to 60 lb	4-hr device, file room, or vault	6-hr device or file room with no combustible near door

5-3 Nonfire-Resistive Buildings.

5-3.1 To adequately protect records in a nonfire-resistive building, the devices required shall be determined by the total weight of combustibles per floor, as shown in Table 5-3.

5-3.2 Any device located in a nonfire-resistive building shall be rated for impact resistance.

Table 5-3
Equipment for a Nonfire-Resistive Building

Total Weight of Combustibles, Including Contents and Building Members of All Floors Including Roof, but not Exterior Walls, Lb Per Sq Ft of Ground Area *(See A-5-1.1(a)(7))*	Record Container Rating
Less than 25 lb	2-hr device or file room, except in one-story and basement buildings (or two-story without basement) 1-hr device (with impact) or file room. Where impacts or blanketing of ruins by collapse of masonry wall or adjoining building is possible, a device or file room of 2-hr or higher rating should be used.
25 to 50 lb	2-hr device or file room.
50 to 100 lb	4-hr device, file room, or vault. 4-hr vault for basement or ground story, 2-hr above.
100 to 150 lb	Vault, file room, or device: basement or ground (first) story, 6-hr; first floor, 4-hr; upper floors, 2-hr.
Over 150 lb	Vault, file room, or device: do not locate in basement or ground story without basement. First floor, 6-hr; second floor, 4-hr; upper floors, 2-hr.

NOTE: Wood weighs approximately 36 lbs/ft^3 (577 kg/m^3).

Chapter 6 Referenced Publications

6-1 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 current as of the date of the NFPA issuance of this document. These references are listed separately to facilitate updating to the latest edition by the user.

6-1.1 NFPA Publications. National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

NFPA 10-1984, *Standard for Portable Fire Extinguishers*

NFPA 13-1985, *Standard for Installation of Sprinkler Systems*

NFPA 14-1986, *Standard for the Installation of Standpipe and Hose Systems*

NFPA 70-1984, *National Electrical Code*

NFPA 71-1985, *Standard for the Installation, Maintenance and Use of Central Station Signaling Systems*

NFPA 72A-1985, *Standard for the Installation, Maintenance and Use of Local Protective Signaling Systems for Guard's Tour, Fire Alarm and Supervisory Service*

NFPA 72B-1986, *Standard for the Installation, Maintenance and Use of Auxiliary Protective Signaling Systems for Fire Alarm Service*

NFPA 72C-1986, *Standard for the Installation, Maintenance and Use of Remote Station Protective Signaling Systems*

NFPA 72D-1986, *Standard for the Installation, Maintenance and Use of Proprietory Protective Signaling Systems*

NFPA 72E-1984, *Standard on Automatic Fire Detectors*

NFPA 220-1985, *Standard on Types of Building Construction*

NFPA 251-1985, *Standard Methods of Fire Tests of Building Construction and Materials*

6-1.2 Other Publications. American National Standards Institute, 1430 Broadway, New York, NY 10018, or Underwriters Laboratories Inc., 333 Pfingsten Rd., Northbrook, IL 60062.

ANSI/UL 72-July 1983, *Safety Standard for Fire Resistance Clasification of Record Protection Equipment*

ANSI/UL 155-November 1979, *Tests for Fire Resistance of Vault and File Storage Room Doors*

Appendix A

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

A-1 Businesses have been discontinued because of the insurmountable task of replacing organizational and operational records. While accurate nationwide statistics are needed, we do know that the losses sustained in fires by these business concerns had the adverse effect of lowering their credit ratings and that some concerns went out of business because of the destruction of their records.

Since the turn of the century, the volume of records, especially of business records, has increased rapidly. These records naturally have to be housed. This need stimulated, through competition among manufacturers, the development of better records containers, especially of lighter weight containers with greater capacity and fire resistance. The heavy, old-line safes of uncertain fire resistance could no longer meet the needs of business and have been largely replaced by modern fire-resistive containers. Newer techniques of records keeping (i.e., microfilm and electronic computers) are creating new problems and new needs.

The greatest need in the records protection field today is better acceptance and study of the records protection problem. Technically, the equipment needed to provide the necessary protection has been produced and ruggedly tested. It is now up to records owners and custodians to learn how to estimate the protection needed and up to architects, contractors, and builders, as well as custodians, to know how to provide this protection.

A-1-6 Authority Having Jurisdiction. The determination of whether records are vital or important, which ultimately determines the level of protection, is appropriately made by the responsible records management official.

A-1-6 Fire-Resistive Building. (*See table A-1-6.*)

A-2-10 Vault doors are capable (1) of preventing the passage into the vault chamber of flame or of heat, above a specified temperature, for the period of time indicated on the label; and (2) of withstanding the stresses and strains due to fire or the application of a fire hose stream while the unit is in a highly heated condition without materially reducing its fire resistance.

A-2-14.1 Automatic sprinklers are the best fire protection devices. Records custodians, librarians, and other keepers of documents are gradually coming to accept automatic sprinklers for protection of books and records on the basis that the sprinklers add negligible water hazards and mitigate the serious fire hazard.

Following is an illustration of the role sprinklers actually play as a possible records protection medium. The Factory Mutual engineering division ran a test on sprinklered and unsprinklered 4-tiered, steel, open deck library stacks. Two fires of identical nature were started in a test section containing 11,000 books. The first test was with automatic sprinklers in service and the second without.

In the sprinklered test, the fire burned unhampered for 3 min and 43 sec when the first sprinkler opened. All fire spread halted at this point. Another sprinkler opened at 7 min and 53 sec and they both discharged for the remainder of the test (30 min from start). Combined, their output was 41 gal/min (26 L/sec) for a total of 978 gal (3 701 L) discharged on 27 percent of the books. Wetting of the books ranged from slightly damp to soaked. Ten percent of the books were fire damaged ranging from slight charring to deep burns. Not a book was knocked from its shelf by the sprinklers.

Table A-1-6 Fire-Resistance Requirements for Type I through Type V Contruction

	Type I		Type II			Type III		Type IV	Type V	
	443	332	222	111	000	211	200	2HH	111	000
EXTERIOR BEARING WALLS —										
Supporting more than one floor, columns or other bearing walls	4	3	2	1	0[1]	2	2	2	1	0[1]
Supporting one floor only	4	3	2	1	0[1]	2	2	2	1	0[1]
Supporting a roof only	4	3	1	1	0[1]	2	2	2	1	0[1]
INTERIOR BEARING WALLS —										
Supporting more than one floor, columns or other bearing walls	4	3	2	1	0	1	0	2	1	0
Supporting one floor only	3	2	2	1	0	1	0	1	1	0
Supporting a roof only	3	2	1	1	0	1	0	1	1	0
COLUMNS —										
Supporting more than one floor, bearing walls or other columns	4	3	2	1	0	1	0	H[2]	1	0
Supporting one floor only	3	2	2	1	0	1	0	H[2]	1	0
Supporting a roof only	3	2	1	1	0	1	0	H[2]	1	0
BEAMS, GIRDERS, TRUSSES & ARCHES —										
Supporting more than one floor, bearing walls or columns	4	3	2	1	0	1	0	H[2]	1	0
Supporting one floor only	3	2	2	1	0	1	0	H[2]	1	0
Supporting a roof only	3	2	1	1	0	1	0	H[2]	1	0
FLOOR CONSTRUCTION	3	2	2	1	0	1	0	H[2]	1	0
ROOF CONSTRUCTION	2	1½	1	1	0	1	0	H[2]	1	0
EXTERIOR NONBEARING WALLS	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]

Those members listed that are permitted to be of approved combustible material.

[1] Requirements for fire resistance of exterior walls, the provision of spandrel wall sections, and the limitation or protection of wall openings are not related to construction type. They need to be specified in other standards and codes, where appropriate, and may be required in addition to the requirements of this Standard for the construction type.

[2] "H" indicates heavy timber members; see text for requirements.

In the unsprinklered test, the fire burned unhampered for 10 min when all four tiers were heavily involved. Hoses were applied since the test structure was in danger. A 1-in. hose line was tried first but had little effect, and a 2½-in. line discharging 265 gal/min (162 L/sec) had to be brought in 17 sec later in order to save the test structure. Books were knocked onto the floor of the tiers and out of the stack. As a result, 89 percent of the books were charred deeply or destroyed, 2½ percent were scorched, and the remaining 8½ percent were soaked.

Sprinklers will work effectively to provide protection for records. The sprinkler performance history shows premature operation of sprinklers to be a negligible problem.

The provision of sprinklers does not assure that no records will be destroyed by fire, but it can minimize the probability of a disastrous records fire.

A-3-2.3 Basement file rooms are undesirable in that under certain conditions burning or smoldering debris may be accumulated in a basement sufficient to produce a "cooking effect" of such duration that cannot be resisted by construction alone (within practical limitations). Basement rooms are apt to be damp, causing destruction of records by mold, and are subject to flooding, under either flood or fire conditions, and consequent damage by water to some or all of the records.

A-4-1 Protection of records from the effects of fire may be said to have begun about 1910 when Underwriters Laboratories Inc., conducted the first test in which both the temperatures of the furnace and of the air inside the record container under test were recorded. While the container first tested was lacking in fire-resistive properties and the test was a crude one as compared with present-day tests of equipment, the method followed set a precedent that was destined to exert an influence not only upon the testing of record containers but upon fire testing in general.

To establish the fire-resistive rating of a records container, it is necessary to measure interior temperatures and fix the maximum allowable temperatures. In view of the fact that the rate of temperature rise inside a safe was influenced by the temperature of the furnace fire, the new method called for closer furnace control and the following of a definite schedule of furnace fire temperatures. Gradually, as fire testing increased, practices tended toward uniformity and eventually to the standard curve now in use.

The maximum permissible interior temperature was originally set at 350°F (177°C) in order to provide a safety factor since the ignition temperature of most paper is somewhat higher. This limit was set before the standard time-temperature curve was adopted and helped to emphasize the desirability of a uniform rule for regulation of testing furnace temperatures. Adoption of a temperature rise limit served to place the rating of record containers upon a quantitative basis.

Recently, requirements for records containers other than paper records storage (e.g., magnetic data processing and photographic media) were developed. The requirements provide limits for interior temperature and humidity because both affect the integrity of such media. These limits are a maximum interior temperature and

humidity of 150°F (66°C and 85 percent RH, respectively).

It has been determined that the above limits provide adequate protection for most of the magnetic and photographic media available today.

A-4-2

(a) Records protection equipment is classified in terms of an interior temperature limit and a time in hours. Two temperature and humidity limits are employed. These are 150°F (65.6°C) with 85 percent RH, which is regarded as limiting conditions for photographic, magnetic, or similar non-paper records, and 350°F (196°C) with 100 percent RH which is regarded as limiting conditions for paper records. The time limits employed are 4-, 3-, 2-, or 1-hr. The complete rating indicates that the specified interior temperature and humidity limits are not exceeded when the record protection equipment is exposed to a standard fire test for the length of time specified.

(b) Ratings are assigned to the various categories as follows:

Insulated Record Containers	— Class 150 — 4 hr
	Class 150 — 3 hr
	Class 150 — 2 hr
	Class 150 — 1 hr
	Class 350 — 4 hr
	Class 350 — 2 hr
	Class 350 — 1 hr
Fire Resistant Safes	— Class 350 — 4 hr
	Class 350 — 2 hr
	Class 350 — 1 hr
Insulated Filing Devices	— Class 350 — 1 hr
Insulated File Drawer	— Class 350 — 1 hr

(c) Insulated records containers and fire resistant safes are effective in withstanding exposure to a standard test fire before and after an impact due to falling 30 ft (9.1 m). Insulated filing devices and file drawers are not subjected to an impact test and are not required to have the strength to endure such an impact.

(d) Insulated records containers and fire resistant safes rated Class 350-1 hour afford more protection to records than insulated filing devices and file drawers rated Class 350-1 hour because of differences in thermocouple locations within the records protection equipment during fire tests.

(e) Insulated records containers, fire resistant safes, and insulated filing devices can withstand a sudden exposure to 2000°F (1093°C) temperature without exploding as a result of such exposure.

(f) Noncombustible cabinets with cellular or solid insulation less than 1 in. (25 mm) thickness have been found to have less than 20 min rating under standard test conditions for insulated filing devices. The exact rating depends upon the thickness and character of the insulation and other factors. Noncombustible uninsulated steel files and cabinets have been found to obtain about a 5-min rating under standard test conditions for insulated filing devices.

A-4-3.3 In many fires, records protection equipment is subjected to severe impact. At times, in nonfire-resistive buildings, floors collapse and the records devices thus fall one or more stories. The resistance of records protection equipment to impact when highly heated will differ markedly from its resistance when cold. It is essential that when these devices are intended for location where impact is probable that their classification indicate resistance to impact.

For protection of valuable records the fire records show that it is not good practice to rely on records protection equipment having less resistance to heat and fire than required for the fire hazard in its vicinity.

The fire records of the past 25 or 30 years show that many so-called "old line" or "iron" safes (i.e., safes of the types made prior to about 1917, i.e., made before the availability of standards and testing facilities, and before the availability of present-day construction methods and materials) involved in many fires in nonfire-resistive buildings, did not protect their contents due to their inability to withstand the stresses and strains (1) resulting from impact caused by falling one or more floors as a result of building collapse, or (2) because their resistance to fire exposure was less than it was assumed to be (prior to about 1917, safes were not usually labeled with their fire rating — today their fire resistance is treated as "uncertain"). It is obviously not good practice to rely on any safe of unknown or uncertain resistance to fire or impact for protection of valuable records.

The selection of a suitable rating for a records device involves the exercise of a certain amount of judgement. When in doubt, it is obviously best to let judgement err on the side of making sure that vital and important records will survive a fire completely consuming the combustibles (fuel) in the fire area of the records enclosure.

If there are many different degrees of fire hazards where vital and important records are or may be stored or used, it is advisable to standardize on a classification or rating that will preserve such records at the place of greatest hazards so that, in the event of a records enclosure being shifted from a place of lightest fire hazard to a place of greatest hazard, the records will not be placed in jeopardy. Increased protecion from external fires can be obtained by placing the records in rated containers in a vault or a file room.

Uninsulated steel containers (closed on six sides) have a field of use in the housing of records stored in fire-resistive vaults or file rooms where all combustible material (other than records in the containers) are completely excluded. Such installations give less opportunity for fire to originate and have a decided retarding effect on the spread of fire, thereby reducing the possibility of a free sweep of flames or the buildup of room temperatures above the ignition point of ordinary combustible materials. Also, the files are protected from fires originating outside of the vault or file room.

A-5-1.1

(a) A method of calculating fuel load.

1. Determine volumes in cu ft for:

(i) Enclosed combustibles, i.e., volume of totally enclosed six-sided steel containers;

(ii) Partially enclosed combustibles, i.e., volume of containers enclosed on five sides with steel; and

(iii) Free combustibles, i.e., volume of combustible containers and all steel containers with less than five sides, plus the volume of paper and books placed on flat

horizontal furniture tops. The volume of free combustibles on flat horizontal furniture tops is figured for furniture 6½ ft or less above the floor. A factor is used to convert the surface area in sq ft of this furniture to a given volume of free combustibles that can be expected to be on the surface. Therefore, the volume of free combustibles on horizontal furniture tops is equal to the total surface area in sq ft divided by 24.

$$\left(\text{Volume} = \frac{\text{total surface area}}{24}\right)$$

2. Determine the weight of all wood or cellulose furniture in lb = A;

3. Determine the weight of all plastic furniture in lb = B;

4. Determine the weight of books and papers enclosed in six-sided steel containers by multiplying the volume of the containers by 28 lb per cu ft = C;

5. Determine the weight of books and papers partially enclosed in five-sided steel containers by multiplying the volume of the containers by 28 lb per cu ft = D;

6. Determine the weight of the free combustibles by multiplying the volume of books and papers located on horizontal surface 6½ ft or less above the floor and the volumes of both combustible containers and steel containers having less than 5 sides by 28 lb per cu ft = E;

7. Calculate the fuel load = F = A + 2B + C + D + E;

8. Calculate the fuel load derating factor (percent):

$$\frac{100 \times C}{F}$$

(i) If the derating percentage is less than 50 percent, use a derating factor G of 60 percent;

(ii) If the derating percentage is 50 percent to 80 percent, use a derating factor G of 80 percent;

(iii) If the derating percentage is more than 80 percent, use a derating factor G of 90 percent;

(iv) In all cases the derating factor for partially enclosed combustibles equals 25 percent;

9. Calculate the total derated fuel load in pounds =

$$H = F\text{-}(C \times G + 0.25D); \text{ and}$$

10. Calculate the derated fuel load (I) in lb per sq ft:

$$I = \frac{H}{\text{gross floor area in sq ft}}$$

(b) Limiting the fuel load to 6 lb/ft² may reduce or eliminate the need for an extinguishing system. This may be accomplished by incorporating all of the following methods.

1. Use enclosed steel records handling equipment to contain all records and file material (i.e., regular or lateral steel filing cabinets);

2. Use steel desks;

3. Use noncombustible, limited combustible, or flame retardant partitions and space dividers;

4. Use noncombustible or flame retardant draperies or other hangings;

5. Use no furniture that presents a large combustible surface, e.g., wooden or plastic wardrobes, supply cabinets, bookcases, etc.;

6. Use no lounge chairs or couches with foam cushioning;

7. Use artificial plants that are either noncombustible or if a plastic type, fire tested to avoid any type of plastic that can drip burning particles; and

8. Use metallic waste baskets.

(c) Complete automatic sprinkler protection may be needed in office space where the fuel load exceeds 6 lb per sq ft.

Following are factors for converting to SI units.

cu ft = 0.028 m³	
sq ft = 0.093 m²	lb = 0.45kg
lb/ft³ = 16kg/m³	ft = 0.305 m

Appendix B Referenced Publications

B-1 The following documents or portions thereof are referenced within this standard for informational purposes only and thus shall not be considered part of the requirements of this document. The edition indicated for each reference is current as of the date of the NFPA issuance of this document. These references are listed separately to facilitate updating to the latest edition by the user.

B-1.1 NFPA Publications. National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

NFPA 40-1982, *Standard for the Storage and Handling of Cellulose Nitrate Motion Picture Film*

NFPA 232AM-1986, *Manual for Fire Protection for Archives and Records Centers*

B-2 Other Publications.

Custer, Richard L.P. and Bright R.G. "Fire Detection: The State-of-the-Art." NBS Technical Note 829. Washington, DC: National Bureau of Standards, U.S. Dept. of Commerce, June 1974, 110 pp., illus., bibliography.

Morris, John. "Managing the Library Fire Risk." Berkeley: University of California Office of Insurance and Risk Management, 1975, 99 pp.

Investigates various aspects of fire prevention and control, with emphasis on the value of automatic fire protection systems. Contains descriptions of several library fires and a chapter on the salvage of wet books. Includes photos, chapter bibliographies, and articles reprinted from fire journals.

Advisory Committee on the Protection of Archives and Records Centers. "Protecting Federal Records Centers and Archives From Fire." Washington, DC: General Services Administration, April 1977, 202 pp., illus., bibliography.

Following the disastrous fire in the Military Personnel Records Center in Overland, Missouri in July 1973, GSA appointed a committee to review the present state-of-the-art in records protection and to make recommendations

on improved fire protection practices for Federal archives and records centers. This book is the report of that committee.

Spawn, William. "After the Water Comes." "Bulletin of the Pennsylvania Library Association." Vol. 28, No. 6 (November 1973), pp. 242-251.

Outlines general principles for salvaging water-damaged materials. Presents a hypothetical disaster and details recommended salvage procedures. The importance of planning for disaster recovery, the necessity for prompt action, and the value of freezing wet materials are highlighted. Includes photos.

Waters, Peter. "Procedures of Salvage of Water-Damaged Library Materials." Washington, DC: The Library of Congress, 1975, 30 pp.

The most comprehensive and up-to-date manual on the salvage of water-damaged materials. Also contains a list of individuals to contact for professional advice and sources for supplies, equipment, and services. Emphasis is placed on having a plan of action before the emergency occurs. Free from Library of Congress.

SUBMITTING PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS

Contact NFPA Standards Administration for final date for receipt of proposals on a specific document.

INSTRUCTIONS

Please use the forms which follow for submitting proposed amendments. Use a separate form for each proposal.

1. For each document on which you are proposing amendment indicate:
   (a) The number and title of the document
   (b) The specific section or paragraph.

2. Check the box indicating whether or not this proposal recommends new text, revised text, or to delete text.

3. In the space identified as "Proposal" include the wording you propose as new or revised text, or indicate if you wish to delete text.

4. In the space titled "Statement of Problem and Substantiation for Proposal" state the problem which will be resolved by your recommendation and give the specific reason for your proposal including copies of tests, research papers, fire experience, etc. If a statement is more than 200 words in length, the technical committee is authorized to abstract it for the Technical Committee Report.

5. Check the box indicating whether or not this proposal is original material, and if it is not, indicate source.

6. If supplementary material (photographs, diagrams, reports, etc.) is included, you may be required to submit sufficient copies for all members and alternates of the technical committee.

NOTE: The NFPA Regulations Governing Committee Projects in Paragraph 10-10 state: Each proposal shall be submitted to the Council Secretary and shall include:

(a) identification of the submitter and his affiliation (Committee, organization, company) where appropriate, and

(b) identification of the document, paragraph of the document to which the proposal is directed, and

(c) a statement of the problem and substantiation for the proposal, and

(d) proposed text of proposal, including the wording to be added, revised (and how revised), or deleted.