Second Revision No. 19-NFPA 909-2024 [New Section after 1.4]

1.5 New Technology.

1.5.1

Nothing in this code shall be intended to restrict new technologies or alternate arrangements, provided the level of protection prescribed by this code is not lowered and is approved by the authority having jurisdiction.

1.5.2

Materials or devices not specifically designated by this code shall be utilized in complete accordance with all conditions, requirements, and limitations of their listings.

Submitter Information Verification

Committee: CUL-AAA

Submittal Date: Thu May 16 11:20:47 EDT 2024

Committee Statement

Committee Statement: The revision allows for new technologies not currently recognized by the code. It adds approval by the AHJ in 1.5.1. The new language is better located following Section 1.4 rather than a new Section 1.7.

Response Message: SR-19-NFPA 909-2024

Public Comment No. 4-NFPA 909-2024 [New Section after 1.6]

Second Revision No. 4-NFPA 909-2024 [Section No. 2.3.1]

2.3.1 ASTM Publications.

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

ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, ~~2023~~ 2023d .

ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, 2022.

ASTM E136, *Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C*, ~~2022~~ 2024a .

ASTM E1591, *Standard Guide for Obtaining Data for Fire Growth Models*, 2020.

ASTM E2652, *Standard Test Method for Assessing Combustibility of Materials Using a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C*, 2022.

ASTM E2965, *Standard Test for Determination of Low Levels of Heat Release Rate for Materials and Products Using an Oxygen Consumption Calorimeter*, 2022a.

ASTM E3082, *Standard Test Methods for Determining the Effectiveness of Fire Retardant Treatments for Natural Christmas Trees*, 2020.

Submitter Information Verification

Committee: CUL-AAA
Submittal Date: Fri May 03 15:55:30 EDT 2024

Committee Statement

Committee Statement: Reference publication update. The revision should meet the intent of the submitter of PC-3.
Response Message: SR-4-NFPA 909-2024

Public Comment No. 3-NFPA 909-2023 [Section No. 2.3.1]

Second Revision No. 5-NFPA 909-2024 [Section No. 2.3.3]

2.3.3 UL Publications.

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

UL 263, *Fire Tests of Building Construction and Materials*, 2011, revised ~~2021~~ 2022 .

UL 294, *Access Control System Units*, ~~2018~~ 2023 .

UL 723, *Test for Surface Burning Characteristics of Building Materials*, 2018, revised 2023 .

UL 1034, *Burglary-Resistant Electric Locking Mechanisms* , 2011, revised 2020.

Submitter Information Verification

Committee: CUL-AAA

Submittal Date: Fri May 03 16:02:02 EDT 2024

Committee Statement

Committee Statement: Reference publication update. The revision also adds UL 1034, which is referenced in 8.3.5.2.1 via SR-16.

Response Message: SR-5-NFPA 909-2024

Second Revision No. 13-NFPA 909-2024 [Section No. 2.4]

2.4 References for Extracts in Mandatory Sections.

NFPA 1, *Fire Code,* ~~2021~~ 2024 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* 2022 edition.

NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work,* ~~2019~~ 2024 edition.

NFPA 70® , National Electrical Code®, 2023 edition.~~:~~

NFPA 72®, National Fire Alarm and Signaling Code®, 2022 edition.

NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems,* ~~2021~~ 2024 edition.

NFPA 101®, *Life Safety Code®,* ~~2021~~ 2024 edition.

NFPA 731, *Standard for the Installation of Premises Security Systems,* 2023 edition.

NFPA 750, *Standard on Water Mist Fire Protection Systems,* 2023 edition.

NFPA 805, *Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants,* 2020 edition.

NFPA 914, *Code for the Protection of Historic Structures,* 2023 edition.

NFPA 921, *Guide for Fire and Explosion Investigations,* ~~2021~~ 2024 edition.

NFPA 1451, *Standard for a Fire and Emergency Service Vehicle Operations Training Program,* 2018 edition.

NFPA 5000®, Building Construction and Safety Code®, ~~2021~~ 2024 edition.

Supplemental Information

File Name	Description	Approved
909_SR-13_Section_2.4.docx		

Submitter Information Verification

Committee: CUL-AAA

Submittal Date: Tue May 07 10:03:45 EDT 2024

Committee Statement

Committee Statement: The revision updates the references for extracts in mandatory sections to the current editions.

Response Message: SR-13-NFPA 909-2024

Second Revision No. 14-NFPA 909-2024 [Section No. 3.3.4]

3.3.4 Arson.

The definition of the crime of arson varies by jurisdiction; however, it is generally defined as the crime of maliciously and intentionally, or recklessly, starting a fire or causing an explosion. *(See 12.5.6.1 of NFPA 921.)* [**921**,~~2021~~ 2024]

Submitter Information Verification

Committee: CUL-AAA
Submittal Date: Tue May 07 10:10:55 EDT 2024

Committee Statement

Committee Statement: Extract update.
Response Message: SR-14-NFPA 909-2024

Second Revision No. 15-NFPA 909-2024 [Section No. 3.3.33]

3.3.33 Fire Watch.

The assignment of a person or persons to an area for the express purpose of notifying the fire department, the building occupants, or both~~,~~ of an emergency; preventing a fire from occurring; extinguishing small fires; protecting the public from fire and life safety dangers. [**1**,~~2021~~ 2024]

Submitter Information Verification

Committee: CUL-AAA
Submittal Date: Tue May 07 10:23:26 EDT 2024

Committee Statement

Committee Statement: Extract update.
Response Message: SR-15-NFPA 909-2024

Second Revision No. 16-NFPA 909-2024 [Section No. 8.3.5.2.1]

8.3.5.2.1

Approved, delayed-egress electrical locking systems shall be permitted to be installed on door assemblies serving low- and ordinary-hazard contents in buildings protected throughout by an approved, supervised automatic fire detection system in accordance with *NFPA 72* or an approved, supervised automatic sprinkler system in accordance with NFPA 13, and where permitted in Chapters 11 through 43 of NFPA 101, provided that all of the following criteria are met:

(1) The delay of the delayed-egress electrical locking system shall deactivate allowing unobstructed egress upon actuation of one of the following:

  (a) Approved, supervised automatic sprinkler system in accordance with NFPA 13

  (b) Not more than one heat detector of an approved, supervised automatic fire detection system in accordance with *NFPA 72*

  (c) Not more than two smoke detectors of an approved, supervised automatic fire detection system in accordance with *NFPA 72*

(2) The delay of the delayed-egress electrical locking system shall deactivate allowing unobstructed egress upon loss of power controlling the lock or locking mechanism.

(3) An irreversible process shall release the electrical lock in the direction of egress within 15 seconds, or 30 seconds where approved by the authority having jurisdiction, upon application of a force to the release device required in 7.2.1.5.3 of NFPA 101 under all of the following conditions:

  (a) The force shall not be required to exceed 67 N (15 lbf).

  (b) The force shall not be required to be continuously applied for more than 3 seconds.

  (c) The initiation of the release process shall activate an audible signal in the vicinity of the door opening.

  (d) Once the electrical lock has been released by the application of force to the releasing device, rearming the delay electronics shall be by manual means only.

(4) A readily visible, durable sign that conforms to the visual characters requirements of ICC A117.1, *Accessible and Usable Buildings and Facilities*, shall be located on the door leaf adjacent to the release device in the direction of egress, and shall read as follows:

  (a) **PUSH UNTIL ALARM SOUNDS, DOOR CAN BE OPENED IN 15 SECONDS**, for doors that swing in the direction of egress travel

  (b) **PULL UNTIL ALARM SOUNDS, DOOR CAN BE OPENED IN 15 SECONDS**, for doors that swing against the direction of egress travel

(5) The egress side of doors equipped with delayed-egress electrical locking systems shall be provided with emergency lighting in accordance with Section 7.9 of NFPA 101.

(6) ~~Hardware~~ Door electromechanical or electromagnetic locking hardware for new installations shall be listed in accordance with UL 294, *Access Control System Units* or UL 1034, *Burglary-Resistant Electric Locking Mechanisms* .

[**101**:7.2.1.6.1.1]

Supplemental Information

File Name	Description	Approved
909_SR-16_8.3.5.2.1.docx		

Submitter Information Verification

Committee: CUL-AAA
Submittal Date: Tue May 07 14:40:25 EDT 2024

Committee Statement

Committee Statement: Extract update. Only item (6) is revised - other underlining is extraneous.
Response Message: SR-16-NFPA 909-2024

Second Revision No. 18-NFPA 909-2024 [Section No. B.1.1]

B.1.1 Fire Experience.

Cultural resource properties are vulnerable to an array of fire threats. During the period from ~~2012–2016~~ 2017–2021 , there was an annual average of ~~over~~ about ~~1,900~~ 1740 fires in cultural resource properties that resulted in property damage of almost ~~$93~~ $63 million per year. The majority of the fires (~~91~~ 92 percent) occurred in religious and funeral properties. Overall, most (68 percent) of the fire alarm times were during hours the property was open to the public (e.g., 9 a.m.–9 p.m.). However, the fires that occurred while the properties were closed to the public resulted in greater direct property damage (~~56~~ 57 percent).

Fires started intentionally (~~18~~ 20 percent) and those ignited by heating equipment (~~14~~ 11 percent) resulted in the greatest fire losses to cultural resource properties~~,~~ for a total of ~~$29~~ $21 million in direct property damage. Cooking equipment caused approximately ~~683~~ 332 fires annually (~~35~~ 19 percent) and resulted in $2 million in direct property damage. Note that in most of the more current data, fires involving cooking equipment and smoking materials appear to be increasing in frequency. This is at least partly due to the introduction of confined structure fire incident types in version 5.0 of the National Fire Incident Reporting System (NFIRS). This change makes it easier to document fires confined to the vessel of origin, including confined cooking fires, confined chimney or flue fires, confined trash fires, and confined fuel burner or boiler fires. Thus, fires in cooking receptacles that did not extend beyond the pan~~,~~ or materials burning in a trash can~~,~~ would be included in this data, increasing the number of incidents shown in the tables under these two categories.

Note: In 1999, the Federal Emergency Management Agency (FEMA) implemented version 5.0 of NFIRS, which changed some of the cause coding used in earlier versions. Therefore, only relative comparisons can be made between leading causes of fires from data collected before 1999 and data collected after.

Submitter Information Verification

Committee: CUL-AAA

Submittal Date: Fri May 10 08:30:16 EDT 2024

Committee Statement

Committee Statement: The revision updates the data to reflect the latest available in "Fires in Cultural Resource Properties" published by the NFPA Research Division in October 2023.

Response Message: SR-18-NFPA 909-2024

Second Revision No. 1-NFPA 909-2024 [Section No. B.2]

B.2 Museums.

There was an annual average of ~~66~~ 58 museum and art gallery fires reported to ~~U.S.~~ US municipal fire departments in the period ~~2012–2016~~ from 2017–2021 *[see Table B.2(a)]*. More than half of these fires (~~58~~ 57 percent) occurred during normal operating hours (9 a.m.–6 p.m.) and resulted in ~~51~~ 59 percent of direct property damage costs *[see Table B.2(b)]*. About 22 percent of fires occurred between 6 p.m. and midnight, resulting in ~~33~~ 3 percent of the property damage. Cooking equipment ~~is~~ was the major cause in ~~31~~ 16 percent of fires but only resulted in ~~3~~ 1 percent of the direct property damage costs *[see Table B.2(c)]*, and ~~only~~ ~~13~~ 19 percent of fires originated in kitchen or cooking areas *[see Table B.2(d)]*.

Table B.2(a) Reported Structure Fires in Museums or Art Galleries by Year ~~2012–2016~~ 2017–2021

Year	Fires
~~2012~~ 2017	~~60~~ 55
~~2013~~ 2018	~~70~~ 69
~~2014~~ 2019	~~70~~ 59
~~2015~~ 2020	~~50~~ 51
~~2016~~ 2021	~~80~~ 56

Note: These are fires reported to ~~U.S.~~ US municipal fire departments and ~~so~~ consequently exclude fires reported only to federal or state agencies or industrial fire brigades. Fires are rounded to the nearest one.

Source: NFIRS and NFPA's Fire Experience Survey.

Table B.2(b) Structure Fires in Museums or Art Galleries by Alarm Time, ~~2012–2016~~ 2017–2021 Annual Averages

Alarm Time	Fires	Direct Property Damage (in Millions)
~~midnight~~ Midnight –3 a.m.	3 (5%)	~~$0.2~~ $0.76 (~~12~~ 24 %)
3 a.m.–6 a.m.	~~2~~ 3 (~~3~~ 6 %)	~~$0.0~~ $0.13 (~~2~~ 4 %)
6 a.m.–9 a.m.	~~9~~ 6 (~~13~~ 10 %)	~~$0.0~~ $0.37 (~~1~~ 12 %)
9 a.m.–noon	~~11~~ 10 (17%)	~~$0.2~~ $0.05 (~~15~~ 2 %)
noon–3 p.m.	~~16~~ 14 (~~25~~ 24 %)	~~$0.3~~ $0.58 (~~20~~ 18 %)
3 p.m.–6 p.m.	~~11~~ 9 (16%)	~~$0.2~~ $1.23 (~~16~~ 39 %)
6 p.m.–9 p.m.	10 (~~1~~ 17 5%)	~~$0.3~~ $0.05 (~~18~~ 1 %)
9 p.m.–midnight	4 (7%)	~~$0.2~~ $0.05 (~~15~~ 2 %)
Total	**~~70~~ 58 (100%)**	**~~$1.5~~ $3.20 (100%)**

Sums might not equal totals due to rounding errors.

Source: NFIRS 5.0 and NFPA's Fire Experience Survey.

Table B.2(c) Leading Causes of Reported Museum or Art Gallery Fires, ~~2012–2016~~ 2017–2021 Annual Averages

Leading Major Causes	Fires	Direct Property Damage (in Millions)
~~Cooking equipment~~	~~21 (31%)~~	~~$0.0 (3%)~~
Heating equipment	13 (~~20~~ 22 %)	~~$0.4~~ <$0.01 (~~23~~ <1 %)
~~Smoking materials~~	~~11 (16%)~~	~~$0.0 (0%)~~
Cooking equipment	10 (16%)	$0.05 (1%)
Electrical distribution and lighting equipment	~~7~~ 9 (~~10~~ 16 %)	~~$0~~ $1.84 (~~1~~ 58 %)
Intentional	4 (~~6~~ 7 %)	~~$0.0~~ $0.43 (~~2~~ 13 %)

Leading Major Causes	Fires	Direct Property Damage (in Millions)
Candles	~~3~~ 1 (~~5~~ 2 %)	~~$0.0~~ <$0.01 (~~0~~ <1 %)
~~Shop tools and industrial equipment excluding torches, burners, or soldering equipment~~	~~3 (4%)~~	~~$0.1 (5%)~~
Exposure	1 (2%)	$0.17 (5%)
Electronic, office, or entertainment equipment	~~2~~ 1 (~~3~~ 1 %)	~~$0.7~~ $0.35 (~~46~~ 11 %)
Fan	< 1 (1%)	$0.02 (< 1%)
Smoking materials	< 1 (1%)	< $0.01 (< 1%)

Note: This table summarizes findings from multiple fields, meaning that the same fire could be listed under multiple causes. Estimates of fires involving electrical distribution or lighting equipment or clothes dryers or washers exclude confined fires. The methodology used is described in ~~"~~ *Methodology and Definitions Used in Leading Cause of Structure Fires Tables*.~~"~~

Source: NFIRS 5.0 and NFPA's Fire Experience Survey.

Table B.2(d) Reported Structure Fires in Museums or Art Galleries by Area of Origin, ~~2012–2016~~ 2017–2021 Annual Averages

Area of Origin	Fires	Direct Property Damage (in Millions)
~~Trash or rubbish chute, area, or container~~	~~9 (14%)~~	~~$0.0 (0%)~~
Kitchen or cooking area	~~9~~ 11 (~~13~~ 19 %)	~~$0.1~~ $0.3 (~~6~~ 1 %)
~~Art gallery, exhibit hall, or library~~	~~6 (9%)~~	~~$0.2 (11%)~~
Unclassified outside area	10 (17%)	$0.00 (0%)
Duct for HVAC, cable, exhaust, heating, or ~~air conditioning~~ AC	~~6~~ 4 (~~9~~ 17 %)	~~$0.0~~ <0.01 (~~0~~ <1 %)
Heating equipment room	~~5~~ 3 (~~8~~ 4 %)	$0.00 (~~2~~ 0 %)
~~Exterior wall surface~~	~~3 (5%)~~	~~$0.0 (1%)~~
Art gallery, exhibit hall or library	3 (5%)	$0.67 (21%)
~~Lavatory, bathroom, locker room, or check room~~	~~3 (5%)~~	~~$0.0 (1%)~~
~~Processing or manufacturing area or workroom~~	~~3 (4%)~~	~~$0.0 (0%)~~
Trash or rubbish chute, area, or container	3 (6%)	< $0.01 (< 1%)
~~Unclassified outside area~~	~~3 (4%)~~	~~$0.0 (0%)~~
Office	2 (~~3~~ 4 %)	$0.0 2 (10%)
Exterior roof surface	2 (~~3~~ 4 %)	~~$0.0~~ <$0.01 (~~3~~ 1 %)
Other	2 (3%)	<$0.01 (<1%)
Unclassified means of egress	2 (3%)	$0.00 (0%)
Unclassified equipment or service area~~ of origin~~	~~2~~ 1 (~~3~~ 1 %)	~~$0.1~~ <$0.01 (~~9~~ <1 %)
~~Storage room, area, tank, or bin~~	~~2 (2%)~~	~~$0.0 (0%)~~
Machinery room or area or elevator machinery room	~~2~~ 1 (~~2~~ 1 %)	$0.01 (< 1%)
Lobby or entrance way	1 (1%)	< $0.01 (< 1%)
Lavatory, bathroom, locker room, or check room	3 (5%)	< $0.01 (< 1%)
Processing or manufacturing area or workroom	3 (4%)	$0.00 (0%)

Area of Origin	Fires	Direct Property Damage (in Millions)
Common room, living room, family room, lounge or den	1 (2%)	$0.03 (1%)
~~Attic or ceiling/roof~~ Ceiling/floor assembly or concealed space	1 (2%)	~~$0.0~~ $0.22 (~~3~~ 7 %)
~~Confined chimney or flue fire~~	~~1 (2%)~~	~~$0.0 (0%)~~
~~Other known area of origin~~	~~9 (13%)~~	~~$0.8 (53%)~~
Exterior balcony, unenclosed porch	1 (1%)	$0.01 (0%)
Laundry room or area	1 (1%)	$0.00 (0%)
Total	**~~67~~ 58 (100%)**	**~~$1.5~~ $20 (100%)**

Note: Sums might not equal totals due to rounding errors. Confined structure fires (NFIRS incident types 113–118) were analyzed separately from ~~nonconfined~~ non-confined structure fires (incident types 110–129, except 113–118). See "*How NFPA's National Estimates Are Calculated for Home Structure Fires*" for details about the methodology used.

Source: NFIRS 5.0 and NFPA's Fire Experience Survey.

B.2.1 Why Museum Fires Spread.

Three factors generally contribute to the spread of fires beyond their area of origin in museums: absence of sprinklers or other means of automatic suppression, lack of adequate compartmentation (or subdivision of areas) combined with a continuity of combustibles, and delayed discovery and reporting of the fire. Large, open exhibit galleries and collection storage areas, use of mobile compact storage units, and combustible collections, furnishings, and exhibit materials are of special concern. In addition, the absence of automatic fire detection and automatic fire suppression can allow the fire to become well established, significantly increasing the likelihood of substantial losses to the building, its contents, and its collections. Detecting and suppressing a fire in the first minutes following ignition can be critical, as it frequently takes only a few minutes for a small fire to grow.

B.2.2 Illustrative Fires.

The following descriptions of fires illustrate some of the more common sources of ignition, factors contributing to the prompt extinguishment or spread of the fire, and the enormity of the losses suffered when protection is not provided. It is important to note that every museum cited in B.2.2.1 through ~~B.2.2.31~~ B.2.2.32 was located in close proximity to a highly trained fire department that responded promptly upon notification of the fire.

Note: The descriptions in B.2.2.1 through ~~B.2.2.31~~ B.2.2.32 are from newspaper articles and other publicly available but unofficial sources~~;~~ . ~~therefore~~ Therefore , attributions of cause, estimates of damage, and other ~~facts~~ information presented in these descriptions could be open to question. Nevertheless, the descriptions illustrate trends and contain information that can be of value in evaluating the overall fire problem in museums.

B.2.2.1 Brazil National Museum, Rio de Janeiro, Brazil — September 2, 2018.

Near total loss. Improperly installed air conditioning units on the ground floor of this 200-year-old museum ignited a fire at approximately 7:30 p.m. that swept through the museum. The 6-hour long fire destroyed up to 90 percent of its 20 million artifact collection and left only the museum's masonry walls standing. While the air conditioning units were the primary cause of the fire, investigators were quick to point out inadequate safety measures led to the fire's unchecked growth. The museum lacked fire hoses, automatic sprinklers, and fire doors. In addition, inadequate site water supply hampered manual firefighting efforts. While museum officials were aware of these deficiencies, years of systemic underfunding of the country's cultural institutions has been blamed for the lack of action in addressing the building's fire protection needs.

B.2.2.2 Smithsonian Institution Building (Castle), Washington, DC — August 16, 2017.

Limited fire damage. An electrical short at the plug for a portable air conditioning unit located on the balcony of the Smithsonian Castle library ignited nearby plastic sheeting and other combustible materials. Workers on scaffolding outside the building noticed the flames and reported the fire to museum security staff, who notified the fire department. Prior to the arrival of firefighters, a single sprinkler activated and controlled the fire. Fire damage was limited to two wooden plaques and a small area of carpeting. Cleanup operations began a few hours after the fire. The building's public areas and staff offices reopened the next morning.

B.2.2.3 National Museum of Natural History, New Delhi, India — April 26, 2016.

Total Loss. The entire collection was destroyed by an early morning (1:45 a.m.) fire that began on the sixth floor of the Federation of Indian Chambers of Commerce & Industry building housing the museum. The fire spread downward, eventually reaching the second floor where the museum's exhibits were located. Upon reaching the second floor, the fire continued to grow, consuming all the exhibits and specimens. It took firefighters 3½ hours to bring the fire under control. No employees or visitors were in the building at the time of the fire. However, six firefighters were treated for smoke inhalation. The primary cause of the fire is undetermined. Contributing factors were the combustible nature of the exhibits and the building's sprinkler system being inoperable.

B.2.2.4 Czech National Museum, Prague, Czech Republic — February 12, 2016.

Estimated loss 10M crowns ($420,000). Some 150 firefighters extinguished a fire that broke out at about 1:30 a.m., damaging about 200 m^2 of the roof and attic of this monumental, 1891 building in Wenceslas Square. The building was undergoing major renovation work, so no collections were inside. The exact cause of the fire was undetermined.

B.2.2.5 Independence National Historical Park, Philadelphia, Pennsylvania — January 13, 2015.

Partial loss, collections damaged. National Park Service and fire department personnel responded to smoke alarms at 7:30 a.m. in the historic Second Bank of the United States, a building within Independence National Historic Park. A small fire was discovered in a basement mechanical unit and was extinguished. There were no injuries or damage to the building structure. However, heavy smoke spread by the building's ventilation system filled the main floor gallery and impacted interior surfaces and the 195 portraits housed in the building. Due to the extensive cleaning and conservation work needed, the museum was closed for several months.

B.2.2.6 National Mississippi River Museum, Dubuque, Iowa — December 12, 2013.

Partial loss. A fire started after mulch had been inappropriately placed on a heating pad in the museum's second-floor turtle area. The fire spread to a nearby decorative wall curtain and was subsequently extinguished by a single sprinkler before firefighters arrived. The fire resulted in smoke and water damage. The aquarium was closed for the night. No animals or people were injured. The total loss was estimated at $1.4 million.

B.2.2.7 Cuming Museum, London, England — March 26, 2013.

Almost 120 firefighters and 20 fire engines tackled a fire that broke out at about 12:30 p.m. in the historic Old Walworth Town Hall, now housing the Cuming Museum and Newington Library. Some 30 people were evacuated from inside the building. The fire was brought under control almost five hours later. The roof was completely destroyed, and partially collapsed, and some of the steel buckled by the intense heat. Although the London fire brigade officers rescued hundreds of objects that had been on display, some 400 objects on display could not be saved, in addition to artifacts in the temporary exhibition room, and water damage to a number of objects in storage. The fire was believed to have been caused by roofers using a blow torch. Following the fire, thieves broke into the burned out museum building and stole an ornate Asian tray and some personal possessions. In March 2016, a decision was made to close the museum, resulting in the loss of four jobs.

B.2.2.8 Smithsonian National Museum of Natural History, Washington, DC — February 7, 2011.

Estimated $250,000 loss. Workmen modifying the museum's cooling tower ignited the combustible fill in one of the tower's cells while cutting a pipe passing through the cell wall with a torch. Although the workmen had a fire watch in place and had examined the immediate area outside of the cell to ensure combustibles were not present, the contents on the other side of cell wall were not adequately examined. Workers were not aware that the steel pipe transitioned to plastic after it passed through the cell wall. Hot slag from the torch cutting operation passed through the interior of the steel pipe, and eventually came to rest within a section of plastic piping within the cooling tower cell. The plastic piping was ignited and the fire spread to the recently installed combustible PVC fill. Workers unsuccessfully attempted to manually extinguish the fire by pouring water into the new opening they had cut into in the steel pipe. Although the fire was detected almost immediately and the fire department summoned without delay, the fire was difficult to extinguish due to restricted access for firefighters and the combustible nature of the fill material. By the time the fire was extinguished, nearly all of the PVC fill in the cell was consumed. The fire was contained to a single cell by the noncombustible concrete construction separating each of the tower's four cells. Fortunately, there was no damage to the museum structure or the collections. The museum's cooling needs were able to be met by operating the remaining three cells until repairs were completed.

B.2.2.9 Butantan Institute, São Paulo, Brazil — May 15, 2010.

Partial loss, collections damaged. Preserved scientific specimens, including approximately 85,000 snakes and 450,000 spiders and scorpions, along with a multitude of scientific research documents at the Butantan Institute were destroyed by fire. The exact cause of the fire is unknown. However, it is suspected to be the result of a faulty electrical circuit in the Reptile Laboratory. The building did not have automatic sprinkler protection or fire detection, and collection storage was not enclosed with fire rated barriers. The flammable liquids used to preserve the specimens contributed to the spread and intensity of flames. Since the fire, the institute has stored specimens in a new building and is rebuilding its collections.

B.2.2.10 Biblical Arts Center, Dallas Texas — June 2005.

Total loss. A late-morning six-alarm fire believed to be caused by arson destroyed the museum and much of its collection. Firefighters needed about five hours to bring the fire under control. The concrete, windowless building did not have an automatic fire suppression system and temperatures inside the building reached about 815°C (1500°F) during the fire. The museum director attempted unsuccessfully to fight the fire in its early stages with portable extinguishers. Everyone in the museum when the fire broke out escaped without any injuries. Among other items, a 38 m × 6 m (124 ft × 20 ft) painting by Torger Thompson, "Miracle at Pentecost," was destroyed.

B.2.2.11 Sallows Military Museum, Alliance, Nebraska — May 2005.

Estimated $250,000 loss. An arson fire caused $250,000 damage to the Sallows Military Museum. The arsonist apparently entered the building by smashing a glass door. Fires were set in two locations in the museum. Structural damage to the museum totaled approximately $100,000, and damage to the collections and contents totaled approximately $150,000. The museum's research room suffered extensive damage from smoke, water, and fire.

B.2.2.12 Millicent Museum, Millicent, Australia — May 1, 2005.

Estimated $400,000 loss. An arson fire caused approximately $400,000 damage to an administrative building and destroyed or severely damaged an undetermined number of books, photographs, and other artifacts, including a collection of Aboriginal artifacts collected over a span of 30 years, horse-drawn carts, and farm machinery. Fire investigators determined the fire started in a rear storage area before spreading to other areas of the museum. The building was not sprinklered.

B.2.2.13 Mosaic Templars Building, Little Rock, Arkansas — March 16, 2005.

Total loss. A fire of undetermined origin that began at about 2 a.m. destroyed the Mosaic Templars building, which was undergoing an $8.6 million renovation to become an African American heritage museum. The Little Rock fire department reported that the fire did not appear to be intentional. The building was built in 1911 as the national headquarters for the Mosaic Templars. There were no collections or archival materials in the building when the fire occurred.

B.2.2.14 Goa State Museum, Goa, India — January 11, 2005.

Partial loss. A fire of undetermined origin, but suspected to be electrical in nature, at the Goa State Museum destroyed two galleries set up by the World Wildlife Fund. No collections were damaged. The fire service received the call at 3:12 p.m. and arrived at the site of the fire 10 to 15 minutes later to find the building engulfed by fire and smoke. It took the fire service about an hour and half to extinguish the fire. The building did not have automatic fire detection or fire suppression systems installed.

B.2.2.15 Castle Museum of Saginaw County, Saginaw, Michigan — November 20, 2004.

Estimated $500,000 loss. An arson fire caused $500,000 damage to the building, but no collections were damaged. When the fire began there were approximately 350 people in the museum, about half of them children. No one was injured in the fire. The arsonist apparently set the blaze in this 6500 m^2 (70,000 ft^2) museum after breaking into the basement and stealing antiques from the museum. The fire began in a locked area of the basement that required the arsonist to breach a locked door. There also was a fire in the front of the museum. During the cleanup, crews, using palm-sized dry sponges cleaned the main hall's 230 m^2 (2500 ft^2) ceiling by hand to remove soot from the fire.

B.2.2.16 Steele County Historical Museum, Hope, North Dakota — October 29, 2004.

Partial loss. A propane leak was the likely cause of an explosion and fire that destroyed a two-story brick building on the grounds of the Steele County Historical Museum at around 7:30 p.m. Investigators said a faulty furnace apparently filled the building with propane, which somehow ignited, blowing out three walls on the second story and causing most of the building's roof to collapse. The building, which was next to the main museum, was being renovated, and most of the collections had been removed.

B.2.2.17 Yankee Air Museum at Willow Run Airport, Van Buren Township, Michigan — October 9, 2004.

Estimated $1 million loss. A fire of undetermined origin destroyed a hangar built in 1941 that housed vintage aircraft at an airport built by Henry Ford to produce World War II bombers on assembly lines like those used at his automotive plants. The fire, which was reported at 6:28 p.m., burned out of control for more than an hour. Aircraft parked near the hangar were not damaged. B-17, C-47, and B-25 aircraft housed in the hanger were moved out of the building before the fire reached them. The museum lost tooling, equipment, and spare parts for the aircraft, and office and display fixtures and equipment totaling well over $1 million in replacement value, along with thousands of irreplaceable artifacts, photos, and books.

B.2.2.18 Sardine Museum, Kujukuri, Chiba, Japan — July 30, 2004.

Partial loss. An explosion of undetermined origin killed one worker and severely burned another. The explosion occurred at approximately 8:50 a.m. as the facility was preparing to open. The blast opened a hole measuring 10 m^2 in the roof of the 8000 m^2 building. The museum contained tanks of sardines, models re-enacting sardine fishing scenes, and household effects from the homes of fishermen.

B.2.2.19 Yaa Asantewaa Museum, Ashanti, Ghana — July 25, 2004.

Total loss. A fire of suspicious origin gutted the museum. Eyewitnesses reported that the fire started at about 12:30 a.m. The museum did not have automatic fire suppression or automatic fire detection systems, and by the time the fire service reached the building it and the museum's collection had been destroyed.

B.2.2.20 National Capital Trolley Museum, Colesville, Maryland — September 28, 2003.

Estimated $8 million loss. A fire, believed to be electrical in nature, in a storage building, next door to the museum, destroyed eight cars and much of the building, causing an $8 million loss. Attendance reportedly dropped 25 percent after the fire because the public believed the fire crippled the museum, which actually reopened six weeks after the fire. The early morning fire burned through the roof and destroyed the trolley cars inside. Among those lost was an 1898 car that swept snow from the tracks in Washington with large brooms made of bamboo reeds. An experimental car from the 1940s and 1950s was destroyed, as was a car that once ferried passengers from Washington to the Great Falls tourist spot on the Potomac River. The wood and masonry museum building did not have an automatic fire suppression system. The museum was rebuilt with steel and protected with an automatic sprinkler system.

B.2.2.21 National Motorcycle Museum, Bickenhill, England — September 16, 2003.

Estimated £20 million loss ($32 million). A discarded cigarette is blamed for a fire that destroyed more than 400 historic motorbikes and damaged another 100. Renovation work on the museum and restoration work on the collection totaled more than £20 million. The museum did not have an automatic fire suppression system at the time of the fire; however, when the museum was restored, an automatic sprinkler system was installed.

B.2.2.22 National Museum of Natural History (Smithsonian Institution) Washington, DC — January 22, 1989.

Estimated $1000 loss. A scientist mistakenly turned on a hotplate as he left his laboratory. A smoke detector alarm was later received in the museum's control room, and a security officer was immediately dispatched to the room. In the two minutes it took for him to arrive at the lab, a single sprinkler had activated to extinguish the fire. Total loss was under $1000.

B.2.2.23 Fort Hill-John C. Calhoun Shrine, Clemson, ~~SC~~ South Carolina — May 30, 1988.

Partial loss. Criminals used gasoline to set fire to this 185-year-old house museum to create a diversion while they burglarized a jewelry store. The museum had been equipped with a sprinkler system in 1968. Three sprinklers operated (one outside and two inside) to extinguish this fire before the fire department arrived. Less than one percent of the museum and its contents were damaged by fire or water.

B.2.2.24 Louisiana State Museum (The Cabildo), New Orleans, ~~LA~~ Louisiana — May 11, 1988.

Estimated $5 million loss. During exterior renovation work on one of the most historic buildings in the ~~U.S.~~ United States , it is believed a torch being used to solder a copper downspout ignited the combustible felt paper or wood in the roof. The fire apparently entered the attic and burned unnoticed for some time before being detected by smoke detectors on the floor below. Notification to the fire department was not automatic and was finally made by a passerby on the street who noticed smoke. Despite heroic efforts by the fire department, the attic, third floor (which was used for collection storage), and roof were lost to fire, and there was significant smoke and water damage to the floors below. An estimated 2 million L (500,000 gal) of water were used to control this fire. The fire chief in charge stated that if the museum had been protected by a sprinkler system, only two sprinklers would probably have been necessary to control or extinguish this fire. Loss was $5 million.

B.2.2.25 Huntington Gallery, San Marino, ~~CA~~ California — October 17, 1985.

Estimated $1.5 million loss. While this art gallery was protected by both smoke and heat detectors, no detectors were installed in the elevator shaft where a fire of electrical origin is thought to have burned for some time before bursting out onto the first floor. Outside air eventually reached the fire source, creating a fireball that traveled 18 m to 21 m (60 ft to 70 ft) down the corridor, totally destroying a painting done in 1777. The gallery was not sprinklered. Loss was $1.5 million.

B.2.2.26 Byer Museum of Art, Evanston, ~~IL~~ Illinois — December 31, 1984.

Estimated $3 million loss. A fire of electrical origin is believed to have originated between the walls on the first floor of this three-story building and apparently burned inside the walls for some time before bursting through into the museum. For an unknown reason, the smoke detection system did not operate. The fire totally destroyed the upper two floors and roof, and firefighting activities caused extensive water damage to the first floor. Loss was $3 million.

B.2.2.27 Museum of Modern Art, Rio de Janeiro, Brazil — July 8, 1978.

Partial loss. Watchmen discovered a fire in this concrete and glass building about 4 a.m. The museum had no automatic fire detection or suppression systems and no interior fire barriers. There also was no emergency plan. The fire probably started from either a cigarette or from defective wiring in an improvised room used for a show a few hours earlier. Fire spread through flammable ceilings and partitions, and within 30 minutes it destroyed 90 percent of the museum's permanent collection (about 1000 works of art) and the paintings borrowed for a special exhibition. It appears that the delayed alarm, the large amount of combustibles present, and lack of an automatic fire suppression system contributed to the large loss.

B.2.2.28 San Diego Aerospace Museum, San Diego, ~~CA~~ California — February 22, 1978.

Estimated $16 million loss. The museum and the International Aerospace Hall of Fame occupied an old wood and stucco exposition building without an automatic fire detection or fire suppression system. Workers in a neighboring structure reported a fire at 8:13 p.m., apparently set by two unknown persons who were seen running away. The first firefighting unit arrived at 8:17 p.m., and the fire department eventually dispatched 14 units comprising 83 of its personnel, but was unable to save the building or its contents. Loss to the building was $15 million, and almost all of the collection, which contained 40 planes, many historic specimens and irreplaceable documents, an aviation library valued at $1 million, and all of the portraits and memorabilia housed in the International Aerospace Hall of Fame. Only a specimen of moon rock survived, having been stored overnight in a fire-resistive safe.

B.2.2.29 National Museum of American History (Smithsonian Institution), Washington, DC — September 30, 1970.

Estimated $1 million loss. A fire reported at 5:05 a.m. destroyed a combustible computer exhibit and damaged the Hall of Numismatics. None of the historic collections of coins and stamps was damaged. The fire walls worked well, but the museum had no automatic fire suppression systems. Water used in fighting the fire caused some damage to the exhibit floor below, and smoke damaged offices and storerooms on two floors above. The cause was probably an electrical short circuit in the exhibit. Loss was over $1 million.

B.2.2.30 Henry Ford Museum, Dearborn, ~~MI~~ Michigan — August 9, 1970.

Estimated $2 million loss. A fire started in a dressing room, possibly from an overheated hair curling iron. Flames quickly spread through several historic shops reconstructed of wood, and a section of agricultural and crafts displays. Excessive combustible storage behind the exhibits aided fire spread in the unsprinklered, undivided, one-story, fire-resistive main exhibit hall of which about 22,296 m^2 (240,000 ft^2) burned. Employees kept fire doors wet with twenty-five 9.5 L (2½ gal) water extinguishers, which prevented the fire from reaching the small museum theater. Loss was over $2 million.

B.2.2.31 Museum of Modern Art, New York City — April 15, 1958.

Estimated $700,000 loss. Workmen repainting the second floor galleries and enlarging the air conditioning system failed to observe established fire safety precautions and smoked on the job while using combustible drop cloths, and then went to lunch leaving paint cans open and stairway doors tied open for convenience in moving equipment. During the noon hour a workman saw a small fire in a drop cloth and called for help. A museum security officer brought a portable extinguisher, and they tried to put out the blaze before turning in an alarm. The fire quickly spread to the cans of paint, untreated wood scaffolding, and combustible gallery partitions, and thick smoke poured into the clustered stairwells. Finally, someone pulled the building alarm and the separate alarm with direct connections to the fire and police departments. More than 500 people in the museum had difficulty escaping, and the smoke-filled stairways and elevator shaft delayed firefighters in locating the fire. The fire was brought under control two hours after the alarm was activated, but not before one person was killed, 33 were injured, two major paintings were destroyed (including a Monet), and seven paintings were severely damaged. Property loss was $700,000.

B.2.2.32 Smithsonian Institution Building (Castle), Washington, DC — January 24, 1865.

Partial loss, collections damaged. A fire broke out in the Smithsonian Institution Building (known as the Castle) days after a solid-fuel stove was connected to a “false flue space,” allowing smoldering embers to enter the structure’s combustible attic undetected. The fire ignited the wooden structure of the building, starting in the attic, consuming the roof, and burning its way down to the lower floors. Smithsonian personnel sounded the alarm, resulting in two fire trucks responding to the scene. Due to the lack of water, the fire raged for over an hour and firefighters had difficulty controlling and suppressing the fire. At the time of the fire (1865), automatic sprinkler and fire detection systems were not yet available. Damage included the roof of the Castle, the lecture hall, and the caps of the towers. The fire resulted in heat and smoke damage to various experiments, manuscripts, books, and notes, mostly related to scientific subjects. Most notably, 200 original oil painting portraits of American Indians from the J. M. Stanley collection were destroyed. In addition, many of the personal effects of James Smithson, the Smithsonian Institution’s founder, were lost. Rebuilding of the structure began quickly in 1867, and improvements to the building were made, including fireproofing and a steam or hot water heating system.

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Committee Statement: The revision updates the tables to reflect the latest available data in "Fires in Cultural Resource Properties" published by the NFPA Research Division in October 2023.

Response Message: SR-1-NFPA 909-2024

Second Revision No. 2-NFPA 909-2024 [Section No. B.3]

B.3 Library Fires.

There was an annual average of ~~over 100~~ nearly 86 library fires reported to ~~U.S.~~ US municipal fire departments in the period ~~2012–2016~~ from 2017–2021 *[see Table B.3(a)]*. Most of these fires (77 percent) occurred during normal operating hours (9 a.m.–9 p.m.) and resulted in ~~69~~ 59 percent of direct property damage costs, while fires that occurred between midnight and 6 a.m. resulted in ~~31~~ less than 6 percent of direct property damage costs *[see Table B.3(b)]*. Intentionally set fires ~~are~~ were the most common cause of library fires and ~~result~~ resulted in the highest direct property damage costs *[see Table B.3(c)]*. Fires that ~~originate~~ originated ~~in a lavatory, bathroom, locker room, or check room typically~~ on an exterior roof surface ~~have~~ had higher direct property damage cost *[see Table B.3(d)]*.

Table B.3(a) Reported Library Structure Fires by Year, ~~2012–2016~~ 2017–2021

Year	Fires
~~2012~~ 2017	~~90~~ 114
~~2013~~ 2018	~~110~~ 93
~~2014~~ 2019	~~100~~ 113
~~2015~~ 2020	~~120~~ 53
~~2016~~ 2021	~~100~~ 56

Note: These are fires reported to ~~U.S.~~ US municipal fire departments and ~~so~~ consequently exclude fires reported only to federal or state agencies or industrial fire brigades. Fires are rounded to the nearest one.

Source: NFIRS 5.0 and NFPA's Fire Experience Survey.

Table B.3(b) Library Structure Fires by Alarm Time, ~~2012–2016~~ 2017–2021 Annual Averages

Alarm Time	Fires	Direct Property Damage (in Thousands)
~~midnight~~ Midnight –3 a.m.	~~4~~ 5 (~~4~~ 5 %)	~~$14~~ $30 (5%)
3 a.m.–6 a.m.	~~4~~ 2 (~~4~~ 2 %)	~~$67~~ $1 (~~24~~ < 1% %)
6 a.m.–9 a.m.	~~9~~ 6 (~~9~~ 7 %)	~~$6~~ $90 (~~2~~ 18 %)
9 a.m.–noon	~~17~~ 15 (~~16~~ 18 %)	~~$24~~ $17 (~~8~~ 3 %)
noon–3 p.m.	~~26~~ 22 (25%)	~~$89~~ $18 (~~32~~ 3 %)
3 p.m.–6 p.m.	~~25~~ 20 (24%)	~~$11~~ $140 (~~4~~ 29 %)
6 a.m.–9 p.m.	~~13~~ 11 (~~13~~ 12 %)	~~$21~~ $117 (~~7~~ 24 %)
9 p.m.–midnight	~~5~~ 6 (~~5~~ 6 %)	~~$49~~ $70 (~~17~~ 15 %)
Total	**~~105~~ 86 (100%)**	**~~$282~~ $483 (100%)**

Note: Sums might not equal totals due to rounding errors.

Source: NFIRS 5.0 and NFPA's Fire Experience Survey.

Table B.3(c) Leading Major Causes of Reported Library Structure Fires, ~~2012–2016~~ 2017–2021 Annual Averages

Leading Cause	Fires	Direct Property Damage (in Thousands)
Intentional	~~47~~ 29 (~~45~~ 34 %)	~~$96~~ $198 (~~34~~ 41 %)
Cooking equipment	~~32~~ 14 (~~30~~ 15 %)	~~$4~~ $86 (~~1~~ 18 %)
Smoking materials	~~21~~ 12 (~~20~~ 13 %)	~~$67~~ < $1 (~~24~~ < 1 %)
Playing with heat source	~~16~~ 10 (~~15~~ 12 %)	~~$5~~ $33 (~~2~~ 7 %)

Leading Cause	Fires	Direct Property Damage (in Thousands)
Heating equipment	~~14~~ 8 (~~13~~ 9 %)	~~$5~~ $8 (2%)
Electrical distribution and lighting equipment	~~11~~ 7 (~~11~~ 9 %)	~~$2~~ $110 (~~1~~ 23 %)
Fan ~~or air conditioner~~	3 (3%)	~~$4~~ $2 (1%)
~~Shop tools and industrial equipment excluding torches, burners, or soldering irons~~	~~2 (2%)~~	~~$3 (1%)~~
Exposure	~~2~~ 1 (~~2~~ 1 %)	~~$67~~ $1 (~~24~~ < 1 %)

Note: This table summarizes findings from multiple fields, meaning that the same fire could be listed under multiple causes. Estimates of fires involving electrical distribution and lighting equipment, clothes dryers or washers, and fans or air conditioners, exclude confined fires. The methodology used is described in " *Methodology and Definitions Used in Leading Cause of Structure Fires Tables.*"

Source: NFIRS 5.0 and NFPA's Fire Experience Survey.

Table B.3(d) Reported Library Structure Fires by Area of Origin, ~~2012–2016~~ 2017– 2021 Annual Averages

Area of Origin	Fires	Direct Property Damage (in Thousands)
Lavatory, bathroom, locker room, or check room	~~23~~ 17 (~~22~~ 19 %)	~~$28~~ $9 (~~10~~ 2 %)
Kitchen or cooking area	10 (12%)	$2 (< 1%)
Trash or rubbish chute, area, or container	~~10~~ 9 (10%)	~~$0~~ < $1 (~~0~~ 0< 1 %)
Unclassified outside area	~~10~~ 8 (~~10~~ 9 %)	~~$6~~ $40 (~~2~~ 8 %)
~~Kitchen or cooking area~~	~~7 (7%)~~	~~$0 (0%)~~
~~Heating equipment room~~	~~5 (5%)~~	~~$0 (0%)~~
~~Lawn, field, or open area~~	~~5 (5%)~~	~~$0 (0%)~~
~~On or near highway, public way, or street~~	~~5 (5%)~~	~~$0 (0%)~~
Courtyard, terrace, or patio	~~3~~ 5 (~~3~~ 6 %)	~~$13~~ $0 (~~5~~ 0 %)
Art gallery, exhibit hall, or library	~~3~~ 4 (~~3~~ 4 %)	~~$2~~ $35 (~~1~~ 7 %)
~~Lobby or entrance way~~	~~3 (3%)~~	~~$50 (18%)~~
~~Unclassified area of origin~~	~~2 (2%)~~	~~$0 (0%)~~
~~Office~~	~~2 (2%)~~	~~$3 (1%)~~
~~Hallway, corridor, or mall~~	~~2 (2%)~~	~~$0 (0%)~~
Exterior roof surface	2 (2%)	$121 (25%)
Lawn, field, or open area	2 (2%)	$5 (1%)
Unclassified means of egress	1 (1%)	$1 (< 1%)
Crawl space or substructure space	~~2~~ 1 (~~2~~ 1 %)	~~$0~~ $26 (~~0~~ 5 %)
~~Other known area of origin~~	~~21 (20%)~~	~~$177 (63%)~~
Attic or ceiling/roof assembly or concealed space	1 (1%)	$35 (7%)
Total	**105 (100%)**	**$282 (100%)**

Note: Sums might not equal totals due to rounding errors. See " *How NFPA's National Estimates Are Calculated for Home Structure Fires*" for details about the methodology used.

Source: NFIRS 5.0 and NFPA's Fire Experience Survey.

B.3.1 Why Library Fires Spread.

The most destructive fires in libraries have been incendiary fires where lack of compartmentation, delayed discovery and reporting, and the absence of automatic suppression or detection systems were common factors. In the absence of automatic fire detection and automatic fire suppression systems, the high fuel loads and continuity of combustibles in libraries can lead to severe, even catastrophic, losses when fires occur in book stacks. Some typical fires involving one or more of these factors are listed in B.3.2.5 through B.3.2.42, including three that tested the resources of three of the largest cities in the United States — Los Angeles, CA; New York, NY; and San Diego, CA.

B.3.2 Illustrative Fires.

The examples in B.3.2.1 through B.3.2.42 illustrate the many ways library fires have started and spread and the destruction they have caused. In these fires alone, tens of millions of valuable books, recordings, and other library collections have needlessly been lost to fire. Damage has been directly proportional to the promptness of discovery, the transmission of an alarm, the availability of automatic fire suppression, and the concentration of combustibles in the fire area. Even the most proficient fire departments are unable to prevent losses such as those experienced during fires at the Jewish Theological Seminary Library, the Klein Law Library, and the Los Angeles Central Public Library in the absence of suitable fire detection and fire suppression systems.

Note: The descriptions in B.3.2.1 through B.3.2.42 are from newspaper articles and other publicly available but unofficial sources~~;~~ . ~~therefore~~ Therefore , attributions of cause, estimates of damage, and other ~~facts~~ information presented in these descriptions might be open to question. Nevertheless, the descriptions illustrate trends and contain information that can be of value in evaluating the overall fire problem in libraries.

B.3.2.1 University of Cape Town Jagger Library, Cape Town, South Africa — April 18, 2021.

Partial loss. A spark from a wildfire on nearby Table Mountain ignited debris in the gutters, which then ignited the roof of the library. The roof collapsed, engulfing the contents of the reading room, which included the extensive special collections. The collections have been described as “probably the continent’s premier collection of Africanist material.” The fire detection system triggered the fire doors, thereby preventing the fire from spreading to other parts of the library. The library is designated as a “heritage building.”

B.3.2.2 Kansas State University Hale Library, Manhattan, Kansas — May 22, 2018.

Estimated $12 million loss. An accidental fire broke out on the roof near the fourth floor of the five-story building during roofing operations, resulting in extensive smoke and water damage throughout the structure. The fire was reported at 4:10 p.m. and went to three alarms prior to containment at approximately 6:30 p.m. Fire damage reportedly was limited to the roof. The new sprinkler system was credited with preventing a worse disaster. The library housed the university’s information technology services, email, and online student and employee systems, which went down due to the fire. Approximately 1.5 million library volumes required cleaning.

B.3.2.3 University Library, Mzugu University, Malawi — December 18, 2015.

Total loss. The fire was discovered at 3:00 a.m. Students who witnessed the fire stated that it was started by a “simple spark” close to the library’s main entrance. The first fire truck on the scene ran out of water while fighting the fire. Two additional engines that arrived shortly thereafter were reportedly driven off by onlookers. By 5:00 a.m., the main portion of the library collapsed. Structural woodwork and carpeting fueled the fire. A total of 45,000 volumes, 80 computers, and all furniture were lost.

B.3.2.4 Academic Institute of Scientific Information on Social Sciences (INION), Moscow, Russia — January 30, 2015.

Partial loss. INION lost 5.42 million of its 14 million volume library collection. Of those destroyed, 2.32 million were unique documents. The fire broke out at approximately 10:00 p.m. on the second floor and continued to burn for approximately 25 hours. At the point of extinguishment, the fire had consumed over 2000 m^2 (21,500 ft^2) of the building and collapsed 1000 m^2 (10,764 ft^2) of roof. Over 150 firefighters fought the fire throughout Friday night and Saturday. Officials suspected the cause to be an electrical short circuit but also could not rule out arson. Fortunately, the fire did not result in any injuries. The building was closed at the time of the fire, and employees had left for the day. Water was cited as responsible for much of the damage to the collection. According to the museum director at the time, the need for a modern fire extinguishing system had been raised with the Academy of Sciences for decades, but the Academy reportedly did not have adequate funding. Founded in 1918, the library's extensive collection included documents in ancient and modern Eastern European languages dating back to the 16th century.

B.3.2.5 Glasgow School of Art Library, Glasgow, Scotland — May 23, 2014.

Total loss. Fire broke out in this listed iconic building just before 12:30 p.m., starting in the basement, and quickly spreading upward through the entire five floors. Although the fire was brought under control quite quickly, significant damage was done to the historic studios and stairways, and the renowned Mackintosh library was destroyed. The fire was attributed to flammable gasses in a canister of spray foam being ignited by a hot projector nearby. A staff member was present when the fire was ignited, but was unable to contain the fast-spreading flames. Contributing to the rapid fire spread were the number of timber lined walls and voids, original ventilation ducts running both vertically and horizontally throughout the building, and a vertical service void running the entire height of the building which allowed the fire to travel unabated. At the time of the fire, installation of a new fire suppression system was nearing completion, but it had been delayed due to the discovery of asbestos.

Charles Rennie Mackintosh is lauded as Scotland's most influential architect and designer, with the art school building that bears his name considered by many to be his greatest masterpiece.

B.3.2.6 Georgetown Neighborhood Library, DC Public Library, Washington, DC — April 30, 2007.

The fire broke out around 12:30 p.m. and quickly spread to the roof, and within minutes of receiving the call, firefighters began to arrive. Firefighters were eventually able to bring the fire under control. All patrons and staff were evacuated from the building safely. The building contained a special collection of Georgetown "local history" known as the Peabody Room. The Peabody collection received only smoke and water damage and was quickly removed from the building and flash frozen. About 90 to 95 percent of the collection was able to be saved, including several paintings and rare items. The general circulating collection received significant water and fire damage resulting in a substantial loss. The Georgetown Library was renovated at a cost of about $26 million.

B.3.2.7 Anna Amalia Library, Weimar, Germany — September 2004.

Estimated 60 million euro ($73 million) loss. A fire in the Anna Amalia Library in Weimar, Germany, destroyed about 10 percent of the library's books and artwork and caused more than 60 million euros of damage. Investigators believe an overloaded electrical circuit caused a smoldering fire that burned for some time in a second floor room of the library before it began to spread. The library was equipped with smoke detection, but there was no automatic fire suppression system installed. Renovation work was under way in the building at the time of the fire.

B.3.2.8 Alexander Blok Library, St. Petersburg, Russia — February 20, 2004.

Partial loss. A five-alarm fire broke out in the building on St. Petersburg's famed Nevsky Prospekt that houses the Alexander Blok Library, as well as an art gallery and shops. The fire was extinguished about five hours after it started. The library's collection of literature and musical scores escaped damage from the flames, but the fire service reported that much of the collection was soaked with water. The building was not sprinklered.

B.3.2.9 University of Georgia Main Library — July 23, 2003.

Estimated $10–$12 million loss. An arson fire broke out in the main library at the University of Georgia at 5:45 p.m., with about 200 people in the building. Although the fire was contained in the second floor, there was smoke damage throughout the building because the fire dampers in the air returns did not shut down the air handling system until heat melted the fire links on dampers. The fire was confined to an area surrounding an office that had been converted to a storage room, which contained computers, books and documents. Although the fire was contained within 20 minutes after firefighters arrived, the second floor of the annex portion of the main library sustained several hundred square feet of fire damage, and the fire burned through a collection of historical documents of the Internal Revenue Service, the Food and Drug Administration, the Securities and Exchange Commission, and the State of Georgia. At the time of the fire, the only smoke detectors in the library were located at the fire doors of each egress stair. Smoke detectors activated the fire alarm that summoned the fire department; however, the fire was fully developed by the time the fire department arrived. The original building is four stories and the annex is seven stories with an eighth floor mechanical penthouse. The building is steel frame with concrete and masonry construction. The basement of the annex was the only portion of the building protected by an automatic sprinkler system at the time of the fire. Property loss and restoration costs were estimated at $10 to $12 million.

B.3.2.10 Bibliotheca Alexandrina, Alexandria, Egypt — March 2, 2003.

Partial loss. A fire, apparently caused by a short circuit in the fourth-floor administrative area, sent thick smoke swirling through the building that had opened to international fanfare in October 2002. The fire lasted about 45 minutes and was confined to the administrative area. No books were destroyed, and the library was able to reopen later in the day; however, the fire prompted authorities to evacuate the 11-story building, and 29 people were taken to hospitals for treatment for smoke inhalation. The $230 million library, which contains about 240,000 books, a planetarium, conference hall, five research institutes, six galleries, and three museums, is located on Alexandria's renovated seaside promenade. The ancient Alexandria library, founded in about 295 B.C. by Ptolemy I Soter, burned in the fourth century.

B.3.2.11 Glasgow University, Scotland, ~~UK~~ United Kingdom — October 25, 2001.

Estimated £12 million ($10.7 million) loss. At 1:30 p.m. a fire broke out on the top floor of the Bower Building, which for 100 years stood out as a proud and distinctive element of the Glasgow University skyline. Around 40 students in the building, which housed an administration center for the Institute of Biomedical and Life Sciences Department, were evacuated by university staff as black smoke billowed from the roof space. Seventy firefighters used aerial jets in an attempt to stop the flames spreading to nearby science buildings on the West End campus. They also removed radioactive material from the top floor of the building. At one point a number of officers were evacuated from inside the building amid fears the weakened structure was in danger of collapsing. Police cordoned off the building as wreckage from the top floor laboratory fell into the second floor. The divisional fire officer said the fire was brought under control at 5 p.m. The cause of the fire is not known, but students reported that firework noises were heard shortly before the blaze broke out at 1:30 p.m.

The blaze destroyed dozens of rare books and manuscripts and records belonging to at least 2000 undergraduate students, as well as equipment worth £3.5 million ($6.25 million), although the greatest loss was a unique collection of 19th century botany books including first editions of Darwin’s work and some original manuscripts valued at more than £2 million ($3.6 million). The books were housed in the library in a room known as the Marshall Room on the third floor of the building underneath the roof space. Damage to the building was estimated at £7 million ($12.5 million).

B.3.2.12 Minnesota Library — 2000.

Estimated $2 million loss. At 11:16 p.m. the fire department responded to a fire in a three-story library of masonry construction. The library was part of an educational complex. Arriving firefighters heard alarms but initially did not see smoke, although they did smell plastic. The fire panel showed heavy smoke, and they found smoke coming from a locked room in the basement. Firefighters encountered more doors and heavier smoke and they began to ventilate the basement and first and second floors. They had to remove the windows because the windows did not open. Investigators determined that the fire originated in the area of the electrical fan and cable television electronic equipment in the video control room. Flame damage was confined to the room of origin, and smoke damage was confined to the floor of origin. Property damage was estimated at $2 million. The property did not have automatic sprinklers.

B.3.2.13 National Archives, Suitland, Maryland — February 29, 2000.

Partial loss. A fire of suspicious origin destroyed about 40,000 pages of archival material stored at the Washington National Records Center in Suitland, MD, which stores more than 3.7 million cubic feet of records. The building's sprinkler alarms activated at 2:30 p.m. and alerted the GSA Control Center that there was a problem. The first fire company arrived sometime between 2:45 p.m. and 2:50 p.m. A fireman on the scene was overcome with smoke at which point firemen abandoned Stack 15 to open the roof hatches to vent the smoke. This process apparently took approximately one hour to accomplish before the firemen returned to Stack 15 to begin to extinguish the fire. The sprinkler system contained the fire during the period between 2:30 p.m. and 3:50 p.m. at which point the firemen were able to enter the stack.

The bulk of the records kept in the area where sprinklers went off were inactive files of deceased war veterans from the Department of Veterans Affairs, and records from the Bureau of Indian Affairs, the Labor Department's Hour and Wage Division, the ~~U.S.~~ US Patent and Trademark office, and District of Columbia government offices. Following the fire, conservators stored wet documents in refrigerated trucks to prevent mold and mildew, and the walls, floors, and boxes in the building were professionally cleaned to remove soot and smoke residue.

B.3.2.14 Bryan College Library Collections, Dayton, Tennessee — February 2000.

Partial loss. Fire destroyed the top floor of a Bryan College building that contained historical documents from the famed Scopes "Monkey Trial," but few papers tied to the famed case were damaged and no one was hurt. The most significant loss of the college's memorabilia from the trial of John Scopes, a science teacher prosecuted for teaching evolution, was William Jennings Bryan's personal copy of Charles Darwin's *The Origin of Species*. The building was completed in the 1950s and had no sprinkler system.

B.3.2.15 Village Library, Centerburg, Ohio — January 28, 2000.

Partial loss. At approximately 2 a.m. the local sheriff deputy spotted smoke coming from the building while making his rounds. Approximately one-third of the second story was involved. Investigation revealed that an electrical heat tape on a water line in the upstairs portion of the building that was used maybe once a month malfunctioned, melted, and ignited. Extinguishment was hindered by an electric line very close to the building and subzero temperatures that caused ice to form as quickly as water was sprayed. The volunteer fire department had no large ladder truck that would reach the roof area of the 2-plus story building, and firefighters had to take down power lines surrounding the library to fight the flames.

The building, a 2-plus story brick building with multiple roof layers, built in 1893, had no fire protection systems. The collection included more than 25,000 videos, CDs, magazines, and historical items. Quick-thinking volunteer firefighters woke the local hardware store owner and got all the plastic sheeting they could find, along with their own tarps, and covered all books shelves before most of the water came down from the second floor. Only 700 books were lost and within six hours of the state fire marshal's release of the building, all materials had been removed. A recovery company freeze-dried some of the books and boxed and stored all materials. The library, which is one of only 17 association libraries in the state of Ohio, was closed for six months following the fire.

B.3.2.16 Central Library, Virginia Beach, Virginia — January 22, 2000.

Partial loss. At 10:00 p.m., a small firebomb tossed through a broken window started a fire that damaged the local history and genealogy section of the city's Central Library. A fire department spokesman said the bomb was filled with a petroleum-type substance. Fire investigators noticed that a nearby window, almost floor-to-ceiling in length, had been broken. They said the break was large enough for the bomb to be tossed through, but not for a person to enter. An alarm alerted the fire service at 10:19 p.m., and four minutes later a ladder truck and a second unit arrived at the library. Smoke had filled the library by the time firefighters consulted the control panel to locate the blaze. Fire officials said the blaze had been quickly controlled by the sprinkler system. A computerized card-catalog terminal and two racks of books sustained fire and water damage, fire department and library officials said, and firefighters finished extinguishing the smoldering fire with portable extinguishers.

B.3.2.17 Linkoping City Library, Linkoping, Sweden — September 20, 1996.

Partial loss. This important city library was largely destroyed by a fire that appeared to have been set deliberately at 11:00 p.m. in the immigrants' information office, which was located in the same building. Six hundred people attending a conference escaped safely. Within 20 minutes the building was fully involved. The fire services were sparing in their use of water in order to prevent water from entering the basement storage areas where the manuscript collections were located. Most of these were saved, although about 70,000 books were lost.

B.3.2.18 Virginia Library, Hampton, Virginia — July 1996.

Estimated $4.5 million loss. At about 10:00 p.m., an occupant of a dormitory in an adjacent structure notified the fire department of a fire on the roof of a structure containing a library and a linen exchange. The one-story building, of ordinary construction, covered an area of 2378 m^2 (25,602 ft^2). Walls were block, the floor framing was concrete, the roof framing and deck were wood, and the roof was covered by built-up tar and gravel. The building had two ceilings. The property was closed for the night. Arriving firefighters found smoke coming from the structure's roof. An investigation revealed that an unknown person had intentionally ignited ordinary combustibles in a rear storage room. Holes in the lower ceiling allowed the fire to spread to the area between the roof and the original ceiling. A brisk wind fanned the fire throughout the building. It is believed that the fire burned for approximately 10 minutes before it was detected. Automatic heat detectors were present in the library and the linen exchange office, but not in the room where the fire started. They were not activated. No suppression system was present. The structure and contents were destroyed. Two vehicles parked nearby were also damaged by radiant heat. Total direct property damage was estimated at $4,500,000. No injuries were reported.

B.3.2.19 Carrington City Library, Carrington City, North Dakota — November 5, 1994.

Total loss. An arson fire destroyed the building and its contents, valued at more than $200,000. Only half of that amount was covered by insurance. The library's entire collection of nearly 13,500 books had to be discarded, with the exception of about 300 books that were in circulation at the time of the fire.

B.3.2.20 Norwich Central Library, Norwich, England — August 1, 1994.

Partial loss. Fire destroyed more than 350,000 books, with many priceless manuscripts, some dating to the 11th century, suffering water damage from firefighter hose streams. The fire is believed to have started as a result of faulty wiring in a bookcase. The collections contained more than two million documents, including cathedral records dating back to 1090. The London Daily Telegraph reported, "Norwich refurbished its 31-year-old library earlier this year [1994] but decided not to install a sprinkler system, fearing it would cause too much damage if there was a fire." Even though the library was located adjacent to the city's main fire station, the fire was out of control by the time the fire department arrived.

B.3.2.21 Grand Canyon Community Library, Grand Canyon Village, Arizona — March 18, 1994.

Estimated $1 million loss. A 9:00 a.m. fire destroyed approximately 14,000 books in a building that had been listed on the National Register of Historic Places. Only 500 books that were in circulation at the time of the fire were not destroyed. Cause of the fire was not reported. Loss was estimated at over $1 million.

B.3.2.22 Dakota County Library Branch, Hastings, Minnesota — June 4, 1993.

Estimated $1.3 million loss. An arson fire involving a juvenile destroyed the entire library collection of 73,500 books and caused $300,000 damage to the building. Damage to books and library furnishings were estimated at more than $1 million. A passing motorist reported the fire at 4:30 a.m. The building had no automatic fire detection or suppression systems because it was considered “up to code” since it had been constructed in 1964 before sprinklers were required.

B.3.2.23 Broward County Main Library, Fort Lauderdale, Florida — March 23, 1993.

Partial loss. The library’s automatic sprinkler system contained a fire in a first-floor trash room at about 9:57 p.m. on a Sunday. Investigators believe a carelessly discarded cigarette caused the fire. Excess trash from a weekend special event in the library contributed to the severity of the fire. Still, only portions of the first floor were damaged, including security and delivery offices and storage rooms. Some library materials in those areas were also damaged.

B.3.2.24 Rio Vista Library, Rio Vista, California — January 16, 1993.

Total loss. A fire caused by a radiator heater igniting combustible materials left nearby when staff departed at 5 p.m. destroyed the library’s total collection of 32,000 books and the historic building that housed them. Persons attending a meeting in a second floor room discovered the fire at 10:15 p.m. Losses were estimated at $1.3 million.

B.3.2.25 South Bend Public Library, South Bend, Indiana — October 28, 1992.

Partial loss. A fire that started in an elevator shaft during the unoccupied early morning hours spread into a mezzanine area, but damage to the building was minimal. The sprinkler system was credited with containing the fire and preventing it from extending into library collection materials. An alarm to the fire department from the building was delayed because the fire detection systems were still not connected more than two weeks after dedication ceremonies for the renovated and expanded building. The fire department found the fire nearly extinguished by the automatic sprinkler system. Damage was limited to smoke, carpet, elevator and elevator shaft, and glass windows to the main entrance door and rooftop skylights.

B.3.2.26 Calgary Public Library, Thornhill Branch, Calgary, Alberta, Canada — April 1, 1990.

Estimated $500,000 loss. Firefighters were called to an arson fire in a building that housed the library and a Calgary social and health services office at 4:30 a.m. Initial estimates of $1 million in losses were subsequently reduced by more than half when it was determined that, of the 60,000 books damaged in the fire, more than 80 percent could be salvaged. These were mostly smoke-damaged books that could be cleaned.

B.3.2.27 Bailey-Howe Library, University of Vermont, Burlington, Vermont — March 21, 1990.

Estimated $105,965 loss. Staff arriving at 7:30 a.m. smelled an electrical burning odor. An electrical fault had ignited the fabric wrapping on an air supply duct in the air return plenum above the suspended ceiling. By the time the source of the smoke was discovered, the fire had burned itself out. At the time of the fire there was no interconnection between the automatic smoke detection system and the air handling system to shut it down upon detection of smoke. Damage to the library was limited to the effects of the smoke and the removal of parts of the ceiling. Final cost to the institution was $105,965. The library reopened two days later, and the most affected part of the building was off-limits to students for the balance of that spring semester. An automatic sprinkler system had been retrofitted to the building in 1981, but only below the suspended ceiling.

B.3.2.28 Nellie McClung Public Library, Victoria, British Columbia, Canada — December 4, 1989.

Estimated $1–$2 million loss. Fire was discovered shortly after midnight by a passing police patrol and at first was suspected to be arson because of the explosive pace of fire development. Arson was subsequently ruled out because no trace of forced entry or use of flammable liquid accelerants was found. The 13-year-old building was gutted and 34,000 books destroyed. It took the firefighters 45 minutes to control the fire and five hours to fully extinguish it. The fire caused damage in the range of $1 million to $2 million to the library and its collections. It was reported that automatic sprinkler protection had only been provided in the boiler room, leaving the remainder of the building unprotected.

B.3.2.29 Library of USSR Academy of Science, Leningrad, Russia — February 14, 1988.

Partial loss. A fire that started as a result of an electrical defect in a newspaper collection storage room of this great library burned for 2 hours unnoticed because the detection system failed. Forty brigades then pumped water into the flames for the next 19 hours. The incident was deemed by Soviet journalists to be a national disaster on a parallel with the Chernobyl nuclear catastrophe. Destroyed by fire were 400,000 volumes of rare or unique works; another 3.6 million books were water soaked. As Pravda reported, “The disaster could well have been prevented.”

B.3.2.30 Los Angeles Central Library, Los Angeles, California

B.3.2.30.1 April 29, 1986.

Partial loss. An arsonist set a fire on tier 5 in the multi-tier book stacks at 10:40 a.m. when there were 400 persons in the library. A detection system gave immediate notice of the fire to a security officer, and the fire department was called. The security officer responded to tier 6 as indicated by the smoke detection annunciator panel but found no fire there at that time. The “deck slits” had not been sealed with smoke barriers when the smoke detection system was installed, as they were still needed for book stack ventilation, which allowed smoke to rise and trigger a detector on another tier. As a result, the opportunity was lost for occupant extinguishment while the fire was small. Time available for occupant action was probably very short because, typical of fires in multi-tier book stacks without automatic sprinkler protection, vertical fire spread through the open deck slits would have been very rapid — possibly less than 10 minutes from tier 5 to the top tier in the book stack (tier 8). The fire department response was prompt, but the fire proved one of the most difficult Los Angeles had ever seen, and it was over 7½ hours later that it was declared under control. More than 400,000 items were destroyed, and 700,000 wet books were placed in freezer warehouses to await eventual restoration. Damage to the reinforced concrete building structure and its historic fabric was extensive and significant. The senior fire service officer, Chief Donald Manning, said “If it had been sprinklered we might have had a few hundred books damaged; we might have had a few thousand dollars damage.” *(See “Investigation Report” in NFPA Fire Journal, March/April 1987.)*

B.3.2.30.2 September 3, 1986.

Estimated $2 million loss. A second incendiary fire struck the Central Library, causing $2 million damage to music collections, where papers had been stacked to start the fire. The public had been excluded from the building since the April 1986 fire, and only staff members and security people were there.

B.3.2.30.3 October 11, 1988.

Estimated $500,000 loss. A third fire resulted when hot metal from welding operations on the third floor dropped down a chute into scrap lumber in the basement. Damage was limited to smudging of the elegant murals that had been cleaned after the 1986 fires at a cost of $500,000. The firefighters put down the flames in 30 minutes.

B.3.2.31 Saint Joseph State Hospital Library, Saint Joseph, Missouri — July 31, 1982.

Partial loss. A fire of incendiary origin in the second-floor library of this three-story medical care facility was controlled with the operation of two automatic sprinklers. The minimal damage was confined to the room of origin.

B.3.2.32 Hollywood Regional Library, Hollywood, California — May 2, 1982.

Estimated $5 million loss. Vandals broke into the library during the night and set it on fire. There were neither sprinklers nor automatic detection equipment. The destruction was almost total, and the loss amounted to more than $5 million. A large and rare motion picture history collection was destroyed. A new building replacing this library was dedicated in June 1986 with the design incorporating modern protection systems (i.e., automatic suppression and detection).

B.3.2.33 University of Utah, Salt Lake City, Utah — December 17, 1981.

Estimated $2600 loss. A fire resulting from an overheated slide projector in the basement of the Eccles Health Sciences Library was extinguished with the operation of two automatic sprinklers. Notification of the public fire department was prompt through the action of smoke detectors. An estimated loss of $2600 was confined for the most part to visual aid equipment.

B.3.2.34 San Diego Aerospace Museum and Library, San Diego, California — February 22, 1978.

Estimated $16.3 million loss. A fire of incendiary origin destroyed the museum and library. The loss, estimated at $16.3 million, included artifacts, works of art, photographs, and the Prudden Collection of 10,000 volumes. At the time of the fire, the 62-year-old structure was undergoing reconstruction, which involved replacement of exterior cement plaster. During this operation the underlying plywood used in the construction was exposed, and the fire was set in the plywood. The building had neither sprinklers nor automatic fire detection systems.

B.3.2.35 Ceres Public Library, Ceres, California — August 14, 1977.

Estimated $230,000 loss. The Gondring Library and several adjacent offices were destroyed in a fire that developed when two youths dropped a paper match into a book return slot. The library loss was approximately $230,000. There were neither sprinklers nor automatic fire detection equipment.

B.3.2.36 University of Toronto Engineering Library, Toronto, Ontario — February 1977.

Estimated $6.25 million loss. A fire of undetermined origin in the Sir Sandford Fleming Building caused severe damage to the Engineering Library collections and to the building. The building loss was estimated at $5.85 million and the cost of repair or replacement of books at $700,000. There were no sprinklers in the building. A detection system sent alarms, but, because alarm circuits were being tested during the night, the signals were confused, causing a delayed response.

B.3.2.37 Temple University Law Library, Philadelphia, Pennsylvania — July 1972.

Estimated $5 million loss. A fire originating in an office area gutted the Charles Klein Law Library and caused extensive damage to the collections. There were neither sprinklers nor automatic detection equipment, and a passerby reported the fire at 1:45 p.m. The fire department attacked the fire and subdued it in 90 minutes, pouring water into the building at the rate of 41,635 L/min (11,000 gpm) at one point. Salvage of wet books held the damage to collections at $1.72 million, while the total loss was estimated at $5 million. *(See "Investigation Report" by A. Elwood Willey in NFPA Fire Journal, November 1972.)*

B.3.2.38 Jewish Theological Seminary Library, New York, New York — April 1966.

Estimated $8.18 million loss. Employees fought an incendiary fire on the 10th floor of a 12-story tower for 20 minutes before calling the fire department. There were no automatic systems for detection or suppression of fire. The loss was estimated at $8.18 million and included irreplaceable books and manuscripts.

B.3.2.39 New York University Library, New York, New York — January 1965.

Estimated $7000 loss. A fire in a library book stack was extinguished with the operation of one automatic sprinkler. Total loss was approximately $7000.

B.3.2.40 Michigan State Library and Office Building, Lansing, Michigan — February 8–13, 1951.

Estimated $2.85 million loss. An incendiary fire burned for five days, resulting in a loss of $2.85 million and two floors of the building that could not be salvaged.

B.3.2.41 New York University Library, New York, New York — February 1951.

Estimated $1000 loss. A fire in the book stacks of a 10-story, completely sprinklered, fire-resistive building was extinguished with the operation of one sprinkler. Total loss was approximately $1000.

B.3.2.42 University of Michigan Department of Government Library, Ann Arbor, Michigan — June 6, 1950.

A daytime fire set by a faculty member resulted in a $637,000 loss.

Supplemental Information

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Committee Statement

Committee Statement: The revision updates the tables to reflect the latest available data in "Fires in Cultural Resource Properties" published by the NFPA Research Division in October 2023 and adds a summary of the University of Cape Town Jagger Library fire.

Response Message: SR-2-NFPA 909-2024

Second Revision No. 3-NFPA 909-2024 [Section No. B.4]

B.4 Places of Worship.

There was an annual average of ~~1,784~~ 1596 place of worship or funeral property fires reported to municipal fire departments in the period ~~2012–2016~~ from 2017–2021 *[see Table B.4(a)].* Most of these fires (~~66~~ 68 percent) occurred during normal operating hours (9 a.m.–9 p.m.) but resulted in only ~~42~~ 46 percent of direct property damage costs, while fires that occurred between midnight and 6 a.m. resulted in ~~35~~ 33 percent of direct property damage costs *[see Table B.4(b)].* ~~The majority (57 percent) of direct property damage costs can be attributed to four causes of fire: intentional, electrical distribution equipment, heating equipment, and electronic, office, or entertainment equipment~~ Intentionally set fires caused the greatest direct property loss (31 percent) *[see Table B.4(c)].* While ~~most fires (30 percent) originated in kitchens, cooking, or heating equipment~~ the leading area of fire origin (21 percent) was kitchens or cooking areas, the direct property damage costs for these fires were relatively low (~~4~~ 5 percent). The ~~most costly~~ costliest fires originated ~~in attics, roof~~ on exterior roof surfaces and in attics, ceiling/roof assemblies, or concealed spaces~~, or large assembly areas~~ *[see Table B.4(d)].*

Table B.4(a) Reported Structure Fires in Places of Worship or Funeral Properties by Year, ~~2012–2016~~ 2017–2021

Year	Fires
~~2012~~ 2017	~~1,750~~ 1902
~~2013~~ 2018	~~1,740~~ 1601
~~2014~~ 2019	~~1,790~~ 1792
~~2015~~ 2020	~~1,890~~ 1295
~~2016~~ 2021	~~1,750~~ 1390

Note: These are fires reported to ~~U.S.~~ US municipal fire departments and ~~so~~ consequently exclude fires reported only to federal or state agencies or industrial fire brigades. ~~Fires are rounded to the nearest 10.~~

Source: NFIRS and NFPA's Fire Experience Survey.

Table B.4(b) Structure Fires in Places of Worship and Funeral Properties by Alarm Time, ~~2012–2016~~ 2017–2021 Annual Averages

Alarm Time	Fires	Direct Property Damage (in Millions)
~~midnight~~ Midnight –3 a.m.	~~110~~ 98 (6%)	~~$14~~ $9 (~~16~~ 15 %)
3 a.m.–6 a.m.	~~110~~ 94 (6%)	~~$16~~ $11 (~~19~~ 18 %)
6 a.m.–9 a.m.	~~200~~ 175 (~~12~~ 11 %)	~~$8~~ $5 (~~10~~ 8 %)
9 a.m.– noon	~~360~~ 286 (~~19~~ 18 %)	$5 (~~5~~ 9 %)
noon–3 p.m.	~~280~~ 272 (~~16~~ 17 %)	~~$15~~ $8 (~~16~~ 14 %)
3 ~~a.m.~~ p.m. –6 p.m.	~~200~~ 269 (~~16~~ 17 %)	$8 (~~8~~ 12 %)
6 ~~a.m.~~ p.m. –9 p.m.	~~260~~ 253 (~~15~~ 16 %)	~~$11~~ $6 (~~13~~ 11 %)
9 p.m.– midnight	~~150~~ 153 (~~9~~ 10 %)	~~$13~~ $9 (~~13~~ 15 %)
Total	**~~1,78~~ 1596 0 (100%)**	**~~$91~~ $59 (100%)**

Note: Sums might not equal totals due to rounding errors.

Source: NFIRS 5.0 and NFPA's Fire Experience Survey.

Table B.4(c) Leading Causes of Reported Structure Fires in Places of Worship or Funeral Properties, ~~2012–2016~~ 2017–2021 Annual Averages

Leading Major Cause	Fires	Direct Property Damage (in Millions)
Intentional	313 (20%)	$18 (31%)
Cooking equipment	~~630~~ 308 (~~36~~ 19 %)	$2 (~~2~~ 3 %)
~~Intentional~~	~~300 (17%)~~	~~$22 (24%)~~

Leading Major Cause	Fires	Direct Property Damage (in Millions)
Heating equipment	169 (11%)	$2 (4%)
Electrical distribution and lighting equipment	~~280~~ 116 (~~16~~ 7 %)	~~$16~~ $5 (~~18~~ 9 %)
~~Heating equipment~~	~~240 (13%)~~	~~$7 (8%)~~
Candles	43 (3%)	$1 (2%)
Fan or air conditioner	~~100~~ 40 (~~5~~ 2 %)	~~$2~~ $1 (2%)
~~Candles~~	~~60 (3%)~~	~~$3 (3%)~~
Exposure	~~50~~ 34 (~~3~~ 2 %)	~~$3~~ $1 (~~3~~ 2 %)
Smoking materials	34 (2%)	< $1 (1%)
Electronic, office, or entertainment equipment	~~40~~ 14 (~~2~~ 1 %)	~~$7~~ $1 (~~7~~ 1 %)
~~Smoking materials~~	~~30 (2%)~~	~~$0 (0%)~~

Note: This table summarizes findings from multiple fields, meaning that the same fire could be listed under multiple causes. The methodology used is described in ~~"~~ *Methodology and Definitions Used in Leading Cause of Structure Fires Tables*.~~"~~

Source: NFIRS 5.0 and NFPA's Fire Experience Survey.

Table B.4(d) Reported Structure Fires in Places of Worship or Funeral Properties by Area of Origin, ~~2012–2016~~ 2017–2021 Annual Averages

Area of Origin	Fires	Direct Property Damage (in Millions)
Kitchen or cooking area	~~470~~ 341 (~~26~~ 21 %)	$3 (~~3~~ 5 %)
Unclassified outside area	~~100~~ 131 (~~6~~ 8 %)	$1 (~~1~~ 3 %)
Heating equipment room	66 (4%)	< $1 (1%)
Small assembly area with less than 100-person capacity	~~80~~ 64 (4%)	$4 (~~4~~ 6 %)
~~Heating equipment room~~	~~70 (4%)~~	~~$1 (1%)~~
Attic or ceiling/roof assembly or concealed space	~~70~~ 55 (~~4~~ 3 %)	~~$10~~ $5 (~~11~~ 9 %)
~~Unclassified area of origin~~	~~60 (3%)~~	~~$1 (1%)~~
Incinerator room or area	52 (3%)	< $1 (1%)
Exterior wall surface	~~60~~ 48 (3%)	~~$2~~ $10 (~~3~~ 18 %)
Office	47 (3%)	$2 (3%)
~~Lavatory, bathroom, locker room, or check room~~	~~60 (3%)~~	~~$1 (1%)~~
~~Large assembly area with fixed seats~~	~~50 (3%)~~	~~$20 (22%)~~
Exterior roof surface	~~50~~ 48 (3%)	~~$4~~ $10 (~~5~~ 18 %)
Other	44 (3%)	$2 (3%)
~~Office~~	~~40 (2%)~~	~~$4 (4%)~~
~~Large open room without fixed seats~~	~~40 (2%)~~	~~$4 (4%)~~
Duct for HVAC, cable, exhaust, heating, or air conditioning	~~30~~ 40 (2%)	$1 (1%)
~~Unclassified storage area~~	~~30 (2%)~~	~~$1 (2%)~~
Large assembly area with fixed seats	36 (2%)	$4 (7%)
Lobby or entrance way	36 (2%)	$1 (2%)
Trash or rubbish chute, area, or container	~~30~~ 35 (2%)	$0 (~~0~~ < 1 %)
~~Unclassified function area~~	~~30 (2%)~~	~~$2 (2%)~~

Area of Origin	Fires	Direct Property Damage (in Millions)
~~Storage room, area, or bin~~	~~30 (2%)~~	~~$1 (1%)~~
~~Lobby or entrance way~~	~~30 (2%)~~	~~$3 (3%)~~
~~Wall assembly or concealed space~~	~~30 (2%)~~	~~$1 (1%)~~
Lavatory, bathroom, locker room or check room	33 (2%)	$0 (1%)
Large open room without fixed seats	31 (2%)	$2 (3%)
Unclassified storage area	29 (2%)	$1 (2%)
Unclassified function area	28 (2%)	$1 (1%)
Other known area of origin	~~430~~ 435 (~~24~~ 27 %)	~~$28~~ $19 (~~30~~ 32 %)
Total	**~~1,780~~ 1596 (100%)**	**~~$91~~ $59 (100%)**

Note: Sums might not equal totals due to rounding errors. Confined structure fires other than chimney or flue fires (NFIRS incident type 113~~,~~ and types 115–118) were analyzed separately from nonconfined structure fires (incident types 110–129, except types 113–118). See "*How NFPA's National Estimates Are Calculated for Home Structure Fires*" for details about the methodology used.

Source: NFIRS 5.0 and NFPA's Fire Experience Survey.

B.4.1 Why Fires in Places of Worship Spread.

The ways in which places of worship are used and their design and construction create many opportunities for fire spread. Delayed discovery and reporting is one of the primary reasons fires in places of worship generally result in significant damage or a total loss of the facilities. The principal factors affecting the spread of fires in places of worship are undivided open areas, concealed spaces, and combustible construction, interior finishes, and furnishings. Automatic sprinklers combined with fire safe building design and fire-resistive construction, finishes, and furnishings are the best way to ensure fire safety in places of worship.

B.4.2 Illustrative Fires in Places of Worship.

The descriptions of fires in B.4.2.2 through B.4.2.39 illustrate some of the more common sources of ignition, factors contributing to fire spread, and the enormity of the losses suffered. It is important to note that these destructive fires are not limited to a particular geographical area or population, but occur across the country ~~—~~ in both rural areas and big cities.

Note: The descriptions in B.4.2.2 through B.4.2.39 are from newspaper articles and other publicly available but unofficial sources~~;~~ . ~~therefore~~ Therefore , attributions of cause, estimates of damage, and other ~~facts~~ information presented in these descriptions might be open to question. Nevertheless, the descriptions illustrate trends and contain information that can be of value in evaluating the overall fire problem in places of worship.

B.4.2.1 St. Mark's Church, St John's Wood, London, United Kingdom — January 26, 2023.

St. Mark's Church is a Victorian, neo-Gothic structure that was built between 1846 and 1847, with a stone spire added in 1864. A Grade II* listed building (defined in the UK as particularly important buildings of more than special interest), the church substantially survived bombing in 1941 during World War II, and work to rebuild the spire was completed in 1955. The church is comprised of a tower with a stone spire above, a nave, a chancel, a baptistery, a chapel, a choir vestry, and an east vestry. Raised galleries supported by cast iron columns in the nave accommodate additional pews. The walls are of substantial ashlar stone construction with a pitched, wood frame slate roof.

On the evening of Thursday, January 26, 2023, a local resident walking their dog reported smoke rising from the church. The priest immediately telephoned the fire department, which arrived on site within five minutes. The response included multiple fire trucks and elevated platform ladders, along with approximately 80 firefighters. Because of the extreme intensity, the fire was not brought under control until around 2:20 the next day. The fire department remained on site completing fire suppression operations until late Friday afternoon.

The fire devastated the main body of the church, consuming all internal fixtures and fittings, along with the roof structure, resulting in the collapse of the roof within the chancel, nave, vestry, and sacristy. The cost of repairs and restoration is estimated at more than £20 million. Given the intensity of the blaze, the exact cause of the fire remains unknown, but arson (the church was unlocked at the time) and an electrical fault are considered the most likely causes. The church was not protected by an operating automatic sprinkler system or an automatic fire detection system.

B.4.2.2 Cathedral Notre-Dame, Paris, France — April 15, 2019.

At around 18:30 local time, fire broke out in the roof void of the Cathedral Notre-Dame. In less than an hour, flames completely engulfed the cathedral's spire, causing it to collapse. Fire investigators were able to rule out arson early in the investigation, but no definitive cause of the fire has yet been established. Various theories suggesting possible ignition sources have been put forward, including a worker's carelessly discarded cigarette and an electrical fault. It is clear that the fire load created by Notre Dame's massive and enclosed timber roof structure, the lack of any effective fire compartmentation, together with the lack of automatic fire sprinklers and the relative inaccessibility of the structure for effective firefighting efforts, allowed the fire to develop and spread rapidly.

Reports have also suggested that while a fire detection system was present in the roof void, it did not include automatic transmission of alarm and fault notifications to a monitoring service. Alarms were investigated locally by the cathedral's security team prior to calling the fire department. Fire department notification was significantly delayed when security team members were initially unable to locate the fire upon receipt of the first alarm. It was only after an additional alarm was received that security team members returned to the attic space, determined there was a fire, returned to the security office, and subsequently notified the fire department. The time from the initial alarm to fire department notification was reported to be 31 minutes.

B.4.2.3 Lutheran Church of Hope, Anchorage, Alaska — January 30, 2016.

Limited loss. Vandals broke into the church through a back window, tipped over the baptismal font in the sanctuary, ripped through some mail, then made their way to the kitchen, where they ignited the stovetop and piled papers on top of the burners. The fire activated the sprinkler system, dousing the fire before it could spread to other parts of the church, with only one head operating. Loss was limited to fire, smoke, and heat damage within the kitchen.

B.4.2.4 Christ the King Catholic Church, Chicago, Illinois — October 7, 2015.

Spontaneous combustion of rags that had been used by volunteers to stain the floors of the choir pews in the sanctuary, as part of a major renovation project, was cited as the cause of a fire that engulfed this church, which had been designated as a Chicago Historic Landmark in 2006. The fire traveled from the front to the back of the church, from the second floor all the way up the roof section and then ran the whole length of the building. Flames could be seen shooting through the roof and steeple. A large portion of the wood truss roof collapsed. The multimillion dollar renovation project was planned to restore the building, which had been damaged by a previous fire in the 1970s.

B.4.2.5 Saint-Donatien Basilica, Nantes, France — June 14, 2015.

An intense fire engulfed the historic neo-Gothic Basilica dating to the 1890s. The fire broke out after morning mass, with worshipers evacuating the building. Much of the roof was destroyed, although more than 40 firefighters worked to contain the fire. Welders conducting waterproofing work on the roof were reported to have accidentally started the fire and attempted to extinguish it, without success. The workers were able to escape the fire; people from the area assisted in removing artifacts and historic artwork from inside the building.

B.4.2.6 New Shiloh Christian Center, Melbourne, Florida — February 16, 2015.

Estimated $5000 loss. Burglars broke into an area of the building that was slated for a trade school, kicked in doors, scrawled graffiti, and set fire to some furniture and chairs in an attached storage unit, and a locked door leading into the maintenance area where the electrical room and a large diesel tank were located. Sprinklers operated, keeping the fire from spreading to the electrical room. The main sanctuary, housed in the same 11,600 m^2 (125,000 ft^2) building, was not affected by smoke or fire. This was the second time in less than two weeks that vandals attacked the building.

B.4.2.7 Second Baptist Church, Houston, Texas — January 1, 2015.

Negligible loss. A single sprinkler extinguished a fire that broke out in a television in the lobby of the church. The building was unoccupied at the time. The fire department ventilated the building with multiple fans and began removal of the water in the lobby. Loss was reportedly limited to a small amount of water damage.

B.4.2.8 St. Mel's Cathedral, Longford, Ireland — December 25, 2009.

Estimated €30 million ($43.2 million) loss. Early Christmas-morning fire broke out at the back of this landmark cathedral, dating back to 1856, and quickly spread to engulf the entire building. The fire burned for several hours, with flames at one point reportedly jumping 18 m (60 ft) into the air. Firefighters' attempts to control the fire were hampered by water shortages due to freezing temperatures affecting the municipal water supply during the especially harsh weather. Only the exterior walls of the cathedral survived, along with the campanile and portico — most of the contents of the building were lost. The fire damaged St. Mel's Crosier, a relic dating back over a thousand years; the entire collection of vestments, penal crosses, altar vessels of pewter and silver was lost, as were a number of Harry Clarke's Celtic Revival stained glass windows, although a few were saved and restored. The cause of the loss was listed as an overextension of the heating system.

B.4.2.9 Trinity Cathedral, St. Petersburg, Russia — August 25, 2006.

Estimated 1.6 million ruble ($60,000) loss. An early evening fire apparently started on scaffolding on the outside of the church, which was undergoing restoration, collapsing the blue central rooftop dome and destroying one of four smaller cupolas surrounding it. Apparently a fire broke out on the scaffolding after someone threw down a cigarette butt. The fire burned through the scaffolding and spread to the central dome. The fire was contained about four hours after it started. Damage to the cathedral, which is included in UNESCO's World Heritage List, was estimated at over 1.6 million rubles.

B.4.2.10 St. Catherine's Church, Gdansk, Poland — May 23, 2006.

Partial loss. A fire in this historic church, which has architectural elements dating back to the 13^{th} century, caused the roof to collapse. Workmen had been repairing the church roof earlier in the day. The church contained Renaissance and Baroque paintings, a museum of church clocks, and a unique carillon — a musical instrument containing several bells. St. Catherine's Church had been largely destroyed by fire in 1905 but had since been reconstructed.

B.4.2.11 University City Church, Charlotte, North Carolina — March 20, 2006.

Estimated $500,000 loss. An arsonist caused about $500,000 in damage to the church after setting more than 20 small fires inside. Investigators described the fires as amateurish. One of the fires was set by piling napkins and other paper on top of a stove in the kitchen and turning on a burner. The fires set off sprinklers inside the church, which triggered an alarm to the fire department. Firefighters put the fire out quickly, and no one was injured.

B.4.2.12 St. Jude's Cathedral, Iqaluit, Nunavut – November 13, 2005.

Partial loss. A fire of suspicious origin caused extensive damage to this igloo-shaped church, an Arctic landmark. The fire also destroyed art works and other artifacts inside the church, which is shaped like an Inuit snow house with a spire atop the dome.

B.4.2.13 Laurel Grove Baptist Church, Franconia, Virginia — December, 2004.

Total loss. An electrical malfunction in the attic of the church ignited a small fire that quickly spread through the 120-year-old wooden structure, destroying the building. The fire was first reported to the county's fire and rescue department at about 4:10 a.m. by a motorist driving by who noticed flames shooting out from the church's roof. About 50 fire and rescue personnel brought the fire under control in about 30 minutes. Two firefighters were slightly injured after slipping on ice created by their hoses.

B.4.2.14 Bethel Church, Elizabeth, West Virginia — December, 2004.

Total loss. An arson fire that appeared to have been a cover for a theft destroyed this historic Wirt County church. There was evidence of larceny and breaking and entering prior to the fire, which was reported at around 9:50 p.m. First-responding fire department personnel found the church fully engulfed in fire. Thieves apparently removed a propane heater and all of the church's 1500 mm (5 ft) wooden pews, which were original pieces of the 1898 church, before starting the fire. The pews, built of solid wood and nailed into the floor, were heavy enough to need at least two people to move them. The church was also the victim of arson in the late 1980s. The church, which was not insured, was a complete loss.

B.4.2.15 Harbin New Synagogue, Beijing, China — November, 2004.

Partial loss. A fire, caused by construction workers, damaged a historic synagogue in the north China city of Harbin. The building, dating from the 1920s when the city boasted a Jewish community of more than 20,000, was undergoing restoration work before reopening as a museum of Jewish history and culture. The fire destroyed nearly half of the newly restored dome. The building was built in 1921, and it was the largest synagogue in the Far East, with a floor area of 1233 m^2 (13,272 ft^2) and room for 800 worshippers.

B.4.2.16 Ebenezer Baptist Church, Pittsburgh, Pennsylvania — March, 2004.

Total loss. A fire, believed to have been electrical in nature, started in the basement of the building and killed two firefighters and injured 29 others when the church collapsed as they tried to put out the fire. According to reports, the fire jumped up the walls and spread rapidly. Firefighters entered the building about an hour after the fire started to douse hot spots when the fire flashed over, engulfing the sanctuary, and the roof and steeple collapsed.

B.4.2.17 Praise International Church, Vancouver, British Columbia — January, 2004.

Total loss. A four-alarm fire of suspicious origin destroyed Vancouver's third-oldest church, a stunningly beautiful heritage-listed building in Mount Pleasant. Neighbors called in the alarm shortly after 5 a.m. after seeing smoke coming out a window. By the time firefighters arrived, the fire had broken through the roof and the building was fully involved. At one point flames were roaring 30 m (100 ft) into the air and more than 35 men and 12 trucks were called in. Nothing was saved from the church, which was totally destroyed. Investigators said the fire appeared to have started in the basement sometime before 5 a.m. The Tudor revival style building built in 1909 featured a high hammer beam and truss ceiling and was the only Tudor revival designed church in the city.

B.4.2.18 Exeter Presbyterian Church, Exeter, New Hampshire — November, 2003.

Total loss. A four-alarm fire, believed to have been caused by a furnace explosion, destroyed a 158-year-old wood-frame church in downtown Exeter. The fire was already well established when firefighters arrived at 7:15 a.m. Just after 9:30 a.m., flames broke through the roof of the church, and about 15 minutes later pieces of the roof started to collapse. Firefighters initially used water from the town of Exeter's hydrant system but later hooked up hose lines to pipe water from the Exeter River as the town's system was strained.

B.4.2.19 St. John's Lutheran Church, Sycamore, Illinois — February 9, 2003.

Total loss. A fire of undetermined origin caused a backdraft that blew the church apart in what has been named the largest backdraft ever documented in the U.S. The backdraft blew the roof off the church and injured two firefighters, who were responding to a rekindle from a fire in the church the day before. The only warning before the blast was a sucking sound. The fire went to a fourth alarm, with 63 firefighters from 11 departments responding. After the fire the church's walls were left standing but the structure was unsalvageable. The church, built in 1937 and measuring 46 m × 49 m (150 ft × 160 ft), was made of stone, plaster, terra cotta tile, heavy timber, and stained glass windows covered with Lexan. The backdraft occurred in the sanctuary, which was located below the main church area and measured 24 m × 46 m (80 ft × 150 ft). Reports indicate that the church had voids, including a crawl space and cold air returns, where heat built up, contributing to the backdraft.

B.4.2.20 Our Lady of the Rosary Church, Pirenopolis, Brazil — September, 2002.

Total loss. An early morning fire of unknown origin destroyed a historic Brazilian church, consuming gold and artwork imported from Portugal in colonial times. Built by slaves in 1728, the church was decorated with imported treasures, as Pirenopolis developed into a rich regional center for silver mining.

B.4.2.21 St. Michael Catholic Church, Wheaton, Illinois — March, 2002.

Total loss ($4.9 million). An arson fire in the church, which did not have smoke detectors, fire alarms, or sprinklers, burned it to the ground. By the time firefighters arrived about 2 a.m. the fire was out of control. The fire occurred on 3/18/02, and it was set by a young adult member of the church who entered the building late at night or in the early morning on his way home from being out with friends. The fire destroyed the building, which consisted primarily of the sanctuary, and damaged the rectory next door. The replacement church building was dedicated in 2006.

B.4.2.22 Salem United Methodist Church, Allentown, Pennsylvania — August 2001.

Partial loss. A fire at about 12:15 p.m., which started as three workers soldered copper on the roof, heavily damaged this 100-year-old wood frame church. The workers noticed smoke while working outside, then used a ladder to get a closer look from inside the attic, before they asked a church employee to call the fire department. The delay in reporting the fire allowed it to spread. The church was most badly damaged in its upper sections.

B.4.2.23 First Presbyterian Church, Lexington, Virginia — August, 2000.

Partial loss. A hot iron used to strip paint ignited a fire that destroyed one sanctuary of the church. The hot iron, used to soften paint before it's scraped, likely ignited material in the roof area of the wood-frame structure. Completed in 1845, Lexington Presbyterian was designed in the Greek Revival style by renowned architect Thomas U. Walter. Confederate Gen. Thomas J. "Stonewall" Jackson worshipped at the church in the years leading up to the Civil War. The sanctuary had undergone some renovation since it was built. The dry, 155-year-old wood posed a greater fire hazard than newer material. The contractor chosen for the work gave members a demonstration of the hot-iron technique and they approved. A senior architectural historian with the Virginia Department of Historic Resources advises against using heat to strip paint on old wood fixtures that are hollow or that can't be seen from behind, like the cornices being stripped at Lexington Presbyterian, where rats or birds sometimes build nests in unseen areas that can catch fire without workers knowing it.

B.4.2.24 Immaculate Heart of Mary Catholic Church, Phoenix, Arizona — April, 2000.

Estimated $1.5 million loss. A fire, of unknown origin, that caused an estimated $1.5 million damage to the church started about 3:15 a.m. along a wall near a candlelit shrine to the Virgin of Guadalupe and spread under the floor and to a choir loft, destroying the church's organ. Officials said firefighters' efforts were hampered by falling chunks of plaster, some weighing 45 kg (100 lb).

B.4.2.25 St. Luke's, Belfast, Pennsylvania — February 29, 2000.

Estimated $1.2 million loss. A spark flying from a saw being used to cut metal siding started a fire within the hollow vestibule wall of the church and, according to the fire investigator, the tower belfry then acted like the chimney of a furnace as fire raced rapidly to the top of the steeple. The wall was not insulated and no modern fire-stops or sprinklers had been installed, so there was nothing to slow the fire's spread. The old church's thick stone side walls and foundation remained intact, but the fire destroyed the sanctuary roof and charred the interior walls, and a portion of the tower collapsed. What the two-hour blaze didn't damage, smoke or water did. No one was injured. The damage was estimated at $1.2 million.

B.4.2.26 St. Mary Magdalene Church, Los Angeles, California — July 2 & 3, 1999.

Estimated $200,000 loss. Two deliberately set fires hours apart caused approximately $200,000 damage to this West Los Angeles church. Firefighters managed to extinguish the fires — one set late Friday and the other early Saturday — before they engulfed the entire facility. The church also suffered an arson fire in 1988 and was reportedly the target of repeated vandalism. Both fires broke out in a utility shed attached to the church. The first fire, reported at 10:41 p.m. Friday, was extinguished with little damage after a church alarm system alerted the fire department, but the second fire, shortly after 1 a.m. Saturday, did extensive damage to a chapel adjoining the church, the roof, and the church electrical system. Church officials and parishioners wondered about possible connections to other nearby church arson fires, including a fire in June 1999 that caused an estimated $1.2 million in damage to St. Thomas the Apostle Roman Catholic Church, four miles to the east. In the last four years, suspicious fires damaged at least two other nearby churches: Our Lady of Lebanon-St. Peter Cathedral Maronite Church and St. Mark Coptic Orthodox Church.

B.4.2.27 Kansas Church — 1999.

Estimated $2.5 million loss. Workers were using a circular saw with a metal cutting blade to cut a metal rod that operated several windows on a second-floor balcony in a church under renovation, when showering sparks ignited a fire. A worker saw the sparks fall onto several wooden structural members exposed at the roofline. The wood ignited easily because it suffered from dry rot and termite infestation, and the fire spread under the roof as workers tried to find water to extinguish it. Firefighters, responding to a 911 call from the construction crew at 9:24 a.m., found flames and smoke coming from the corner of the church roof. Workers tried to extinguish the blaze, but the delay in notifying the fire department and the lack of a standby fire extinguisher allowed the fire to spread. The two-story church was of wood-frame construction, with stone walls and a slate roof. It did not have sprinklers or fire detection equipment and was open at the time of the fire. A fire department official observed that, if workers had had access to an extinguisher, it might have been possible to save the building. This type of work qualifies as hot work per NFPA 51B. If NFPA 51B had been followed, a fire watch with an extinguisher would have been established after a hot work permit was issued. Estimated structural loss was reported at $2 million, with contents loss at $500,000. There were no injuries.

B.4.2.28 Barrington United Methodist Church, Barrington, IL — October 28, 1998.

Total loss ($4 million). A maintenance worker called 911 at 12:06 p.m. to report a fire in this two-story church that was undergoing exterior renovations. The church, originally built in 1880, had wood frame, balloon construction. The walls, roof framing, and roof deck were wood, and the floors were wood joist. The roof was covered with asphalt shingles. The worker smelled smoke in the chapel area and found fire inside the wall. He tried to put out the fire with an extinguisher but was forced back by smoke. A smoke alarm also sounded, but activation was delayed because of the fire location. A partial sprinkler system in the basement was not a factor in the fire. When firefighters arrived, they found heavy black smoke coming from the roof and bell tower. Upon entering the building, they found heavy fire overhead and were ordered out of the building.

Workers using a heat gun to strip paint from windows stopped working at about 11:45 a.m., but left the heat gun plugged in and lying on the scaffolding. Heat from the gun ignited wood and/or dust on the scaffolding. The fire quickly traveled through the balloon construction to the attic and through the common space. Damage to the structure was estimated at $2 million, and loss to the contents was also estimated at $2 million. Both represented total losses. One civilian and one firefighter were injured in this fire.

B.4.2.29 Kharkiv Synagogue, Kiev, Ukraine — September, 1998.

Partial loss. A fire of suspicious origin damaged one of Ukraine's largest synagogues. The fire in the sanctuary of the synagogue began at 2 a.m. and raged for several hours before firefighters put it out. The sanctuary was being reconstructed and had no electric wires or gas pipes at the time. Fire spread to the ceiling of the sanctuary, which is as high as a five-story building, but the Torah scrolls were saved. The synagogue was built around 1910 but shortly afterward was converted into a sports stadium by the Soviet government.

B.4.2.30 Central Synagogue, New York, New York — August, 1998.

Partial loss. New York City firefighters spent nearly three hours bringing a fire under control in a landmark Manhattan synagogue. A fire department spokesman says the blaze broke out in the roof of the 126-year-old structure on Lexington Avenue and 55th Street just after 5 p.m. and quickly went to five alarms, with 45 trucks and 250 firefighters responding. Fire crews poured water on the building from the outside and finally controlled the fire just before 8 p.m. Apparently a small fire started while some work was being done on the building's air conditioning system, and workers believed they had put it out.

B.4.2.31 Pennsylvania Church —1998.

Estimated $6 million loss. This 2½-story church was constructed of heavy timber and was closed for the night when the fire occurred. The church had no automatic suppression system, and its complete-coverage automatic detection system, of unreported type, failed to activate. However, at 4:52 a.m. a burglar alarm system activated and summoned police, who spotted the fire when they responded. The blaze started in a ceiling/floor assembly over the janitor’s room in the basement when an unidentified electrical source ignited wood framing material. The fire spread to the sanctuary. Two firefighters were injured. A contributing factor to the rapid growth of the fire was that as the ceiling over the janitor’s room collapsed, the fire spread through voids in the construction.

B.4.2.32 Wisconsin Church — 1998.

Estimated $1.1 million loss. A church worker called 911 at 9:19 p.m. to report a fire in this two-story, wood-frame church. The structure measured 61 m × 15 m (200 ft × 50 ft), the walls, floor framing, roof framing, and roof deck were wood, and the roof was covered with asphalt shingles. Several volunteers had been attempting to eliminate bees and/or hornets from under the eaves. One individual sprayed ether into about 12 joist pockets. In one pocket, a cigarette lighter was used to create a blowtorch effect with the ether can, with the intention of burning out the insects. This created a small fireball, which workers attempted to pat out with their hands. Believing the fire was out, they continued to spray other joists. The volunteers noticed smoke coming from the roof peak 15 to 20 minutes later. They entered the church, tore down a piece of suspended ceiling, and found fire in the concealed space. They tried to put the fire out with several extinguishers. When these efforts were unsuccessful, the fire department was called.

The extensive use of ether caused the fire to spread quickly and far. Before a significant interior attack could be launched, firefighters had to ventilate the building of ether vapors. There was about 400 mm (16 in.) of space between the plywood roof deck and the bottom of the joist. About 355 mm (14 in.) of insulation was in place, leaving a 50 mm to 76 mm (2 in. to 3 in.) air space above the insulation and below the plywood. This space acted like a chimney to draw the fire and fumes toward the peak of this 11 m (36 ft) tall structure. Firefighters opened a small area of the roof in an attempt to ventilate the structure and reach the fire, but the fire’s rapid acceleration forced them off the roof before completing the task.

Firefighters used large exterior streams from ladder trucks and conducted difficult interior operations in an attempt to control the fire. The fire was shielded from the hose streams by the roof until the roof burned off. A large interior balcony also shielded the fire and made it difficult to get water into the ceiling area. Direct property damage to the $1.5 million structure was estimated at $1 million. Damage to the $250,000 in contents was estimated at $135,000. No injuries were reported. Smoke alarms were present in the interior of the structure, but they were not in the roof joist area and did not operate.

B.4.2.33 Texas Church — 1998.

Estimated $300,000 loss. At about 4:30 a.m., a motion sensor burglar alarm in this 30 m × 30 m (100 ft × 100 ft), single-story church sounded at an alarm company and was relayed to the police station. The police who arrived at the scene notified the fire department of a fire at the site. The structure had brick veneer, concrete floors, and a metal roof deck with dropped ceiling. The roof was covered with tar and gravel. The church was closed for the night. No fire protection systems were present.

Investigators learned that four males, including one juvenile, broke a glass door panel with a hammer and entered the church. They squirted lighter fluid on the carpet in the hallway leading to the fellowship hall and lit it. This fire was not intense enough to satisfy them, so they returned, poured gasoline inside the building, and threw Molotov cocktails inside. Direct property damage to the structure, valued at $1.5 million, was estimated at $165,000. Damage to the $500,000 in contents was estimated at $135,000. No injuries were reported.

All four suspects pled guilty to charges of arson in a place of worship. Two were sentenced to federal prison, one to a state prison, and the juvenile went to a juvenile facility. Prior to setting this fire, the perpetrators had spent the night drinking, using drugs, and vandalizing cars and homes.

B.4.2.34 Michigan Church — 1997.

Total loss. A passerby called 911 at 8:25 p.m. to report a fire in this one-story church, which measured 13 m × 19 m (42 ft × 62 ft) with an additional entry section measuring 3.3 m × 6 m (11 ft × 20 ft.) It also had a finished basement. Exterior walls were brick; interior walls were wood and plaster; the floor, roof framing, and roof deck were wood; and the roof was shingled. No fire protection systems were present. Arriving firefighters found smoke showing on all sides. An interior attack was begun, but due to heavy fire conditions, all personnel were evacuated and firefighting went to a defensive mode.

The fire originated in the floor joists under the pulpit, between the finished floor of the chapel and the finished ceiling of the basement. The only heat source in that area was electrical wiring, and it appeared that the wiring overheated and ignited floor joints and subflooring, where the fire burned for quite a while. The fire spread into the walls, traveled horizontally across the attic, and vented out of the roof. When the fire entered the chapel, combustible materials, including seating and wood walls, fed it. When the roof collapsed the entire first floor was destroyed, and the basement suffered water and smoke damage. Direct property damage was estimated at $200,000, equal to the total value. No injuries were reported.

B.4.2.35 Kentucky Church — 1997.

Estimated $700,000 loss. At 1:54 a.m. a passerby called 911 to report a fire at this two-story church of unprotected ordinary construction. The church had brick veneer on the walls, the floor framing was concrete with tile, the roof framing and deck were wood, and asphalt shingles covered the roof. The structure had a ground floor area of 232 m^2 (2,500 ft^2). No fire protection systems were present, and the church was closed for the night. The fire started in a confessional after the thermostat turned on the heater. The heat spread to cardboard boxes containing wine. The cardboard ignited, and flames spread to the wood veneer, curtains, and other items in the confessional. The fire spread upward and outward to other interior finishes and then spread throughout the church. Heavy winds fanned the fire after it vented through the roof. The fire caused an estimated $700,000 in direct property damage. No injuries were reported.

B.4.2.36 Oklahoma Church — 1996.

Total loss. At 4:01 a.m. a passerby called 911 to report a fire in this one-story frame structure with brick veneer. The structure was 46 m × 15 m (150 ft × 50 ft) and was closed for the night. Arriving firefighters found heavy smoke conditions and fire showing. The west wing was fully involved, and the fire had vented through the south side of the gable roof. The roof of the west side collapsed 20 to 30 minutes later. The fire spread to the east section of the building and that portion of the roof collapsed onto the floor area. The structure, valued at $225,000, and the contents, valued at $125,000, were totally destroyed. No injuries were reported.

An investigation revealed that a window had been broken out, and a glass container filled with gasoline had been tossed inside the dining room area. The arsonist used a match to light the gasoline. Two days later, a 35-year-old white male was arrested for arson. The suspect had been arrested for arson twice as a teenager in another state. He was judged incompetent to stand trial and transferred to a psychiatric hospital. Given the perpetrator's condition, law enforcement officials felt the crime was not racially motivated, although the church had a predominantly African American congregation.

B.4.2.37 Minnesota Church — 1996.

Total loss. A passerby notified the fire department of a fire at this one-story, wood-frame, balloon-construction church. The structure, built in 1961, was 31 m × 18 m (102 ft × 60 ft wide). The church had a full basement under it. The school/office area was built on a slab and footings. There were no detection or suppression systems. The church was closed up about an hour before the fire was reported. A farmer several miles away saw smoke and flames coming from the church and used his cell phone to notify the fire department. When the fire department arrived, they found heavy fire and smoke coming from the front school addition of the church. As the fire progressed, the roof of the main church collapsed, the first floor collapsed into the basement, and the roof over the fellowship hall partially collapsed. The fire department fought the fire all night. The structure and its contents, valued at $850,000, were totally destroyed. No injuries were reported.

An investigation revealed that the fire had started in a closet under the balcony when an electrical outlet and associated wiring shorted out or faulted and ignited the adjacent combustible material. The fire smoldered in the wall cavity for a long period of time before spreading to the exterior and then traveling up the wall to the roof.

B.4.2.38 Arizona Church — 1996.

Estimated $1.8 million loss. At 5:19 a.m. a neighbor called the fire department to report smoke and flames coming from the church. The structure was 45 m × 19 m (148 ft × 62 ft), and approximately 11 m (35 ft) at the roof peak. It was brick masonry construction, with brick masonry walls, concrete slab floor, metal truss roof framing, wood-plank roof deck, and built-up rolled roof covering. The structure was closed at the time. Investigators found multiple points of origin, including artificial flowers in the hallway outside the conference room and hymnals scattered in pew areas in the sanctuary. No sign of forcible entry was found, and it appeared that the front middle doors were not secured at the time of the fire. Because of the numerous activities in the building, investigators believed it likely that a door or window could be easily overlooked when locking up. The wood pews, with upholstered and foam-cushioned seats, and books facilitated rapid fire growth and flame spread. The large uncompartmentalized sanctuary and the stained glass windows allowed the fire to burn and grow for a significant period of time before the upper windows failed and flames became visible to the outside.

The incendiary fire caused an estimated $1.2 million in direct property damage to the $6 million structure and $600,000 in damage to the contents, which were valued at $1 million. No injuries were reported. No automatic detection or suppression systems were present in the structure. HVAC system fire dampers operated and probably slowed the spread of fire through the attic space. Draft stops in the attic space above the ceiling ran wall to wall and roof to ceiling and also helped slow the fire.

B.4.2.39 Wisconsin Church — 1996.

Total loss. At 3:10 a.m. a passerby notified the fire department of a possible fire at this brick and heavy timber structure. The 3½-story building was 24 m × 30 m (80 ft × 100 ft). Walls were made of brick and tile, the floor framing was heavy timber, the roof framing was wood and steel, the roof deck was wood, and the roof covering was asphalt. No fire protection systems were present, and the facility was closed for the night. Arriving firefighters found the fire in the basement women's room. Firefighters were able to knock down most of the fire in the room; however, parts of the ceiling came down and showed that fire had spread to the next floor, so the firefighters backed out and went into a defensive mode.

An investigation revealed that, during the evening's service, two 15-year-old girls had passed a note in their confirmation class stating that the church would be burned down by morning. The girls had used a lighter to ignite a candle and then had started a fire in some silk flowers in the powder room. From there, the fire spread up into the false ceiling and from one floor to the next and out through the roof. It also extended to the main worship area ceiling and caused the ceiling to burn and fall down. People in the area had smelled wood burning but assumed it was a fireplace. It is believed that the fire burned for at least 5 hours before it was discovered. The structure, valued at $2.6 million, and its contents, valued at $1.9 million, were completely destroyed. Two firefighters were injured when they slipped on ice. The two girls were sentenced to 100 hours of community service to the church, probation for one year, and $2,000 in restitution.

Supplemental Information

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Committee Statement

Committee Statement: The revision updates the tables to reflect the latest available data in "Fires in Cultural Resource Properties" published by the NFPA Research Division in October 2023 and adds a summary of the St. Mark's Church fire.

Response Message: SR-3-NFPA 909-2024

Second Revision No. 6-NFPA 909-2024 [Section No. N.1.2.1]

N.1.2.1 ASTM Publications.

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

ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, 2022.

ASTM E1355, *Standard Guide for Evaluating the Predictive Capability of Deterministic Fire Models*, ~~2012 (2018)~~ 2023 .

ASTM E1472, *Standard Guide for Documenting Computer Software for Fire Models*, 2007 (withdrawn 2011).

Submitter Information Verification

Committee: CUL-AAA

Submittal Date: Fri May 03 16:06:40 EDT 2024

Committee Statement

Committee Statement: Reference publication update.

Response Message: SR-6-NFPA 909-2024

Second Revision No. 7-NFPA 909-2024 [Section No. N.1.2.2]

N.1.2.2 BHMA Publications.

Builders Hardware Manufacturers Association, 355 Lexington Avenue, 15th ~~floor~~ Floor , New York, NY 10017.

ANSI/BHMA A156.1, *Butts and Hinges,*2021.

ANSI/BHMA A156.2, *Bored ~~&~~ and Preassembled Locks and Latches,*2022.

ANSI/BHMA A156.4, *Door Control – Closers*, 2019.

ANSI/BHMA A156.5, *Cylinders and Input Devices for Locks*, 2020.

ANSI/BHMA A156.12, *Interconnected Locks*, 2022.

ANSI/BHMA A156.13, *Mortise Locks*, 2022.

ANSI/BHMA A156.16, *Auxiliary Hardware*, 2018.

ANSI/BHMA A156.17, *Self-Closing Hinges & Pivots*, 2019.

ANSI/BHMA A156.23, *Electromagnetic Locks*, 2017.

ANSI/BHMA A156.24, *Delayed Egress Locking Systems*, 2022.

ANSI/BHMA A156.25, *Electrified Locking Systems*, 2023.

ANSI/BHMA A156.26, *Continuous Hinges*, 2021.

ANSI/BHMA A156.28, *Recommended Practices for Mechanical Keying Systems*, ~~2018~~ 2023 .

ANSI/BHMA A156.30, *High Security Cylinders*, 2020.

ANSI/BHMA A156.31, *Electric Strikes and Frame Mounted Actuators*, 2019.

Submitter Information Verification

Committee: CUL-AAA
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Committee Statement

Committee Statement: Reference publication update.
Response Message: SR-7-NFPA 909-2024

Second Revision No. 8-NFPA 909-2024 [Section No. N.1.2.3]

N.1.2.3 FM Publications.

FM Global, 270 Central Avenue, P.O. Box 7500, Johnston, RI 02919, www.fmglobal.com.

FM Data Sheet 9-19, *Wildland Fire*, 2022, revised 2024 .

Submitter Information Verification

Committee: CUL-AAA
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Committee Statement

Committee Statement: Reference publication update.
Response Message: SR-8-NFPA 909-2024

Second Revision No. 9-NFPA 909-2024 [Section No. N.1.2.5]

N.1.2.5 IEEE Publications.

IEEE Operations Center, 445 Hoes Lane, Piscataway, NJ 08854-4141.

IEEE 802.11, *IEEE Standard for Information ~~technology~~ Technology — Telecommunications and ~~information exchange between systems Local and metropolitan area networks — Specific requirements~~ Information Exchange between Systems - Local and Metropolitan Area Networks — Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications*, 2020.

Submitter Information Verification

Committee: CUL-AAA
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Committee Statement

Committee Statement: Reference publication update.
Response Message: SR-9-NFPA 909-2024

Second Revision No. 10-NFPA 909-2024 [Section No. N.1.2.8]

N.1.2.8 Steel Door Institute Publications.

Steel Door Institute, 30200 Detroit Road, Westlake, OH 44145.

ANSI/SDI A250.4, *Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors*, 2022.

ANSI/SDI A250.8, *Specifications for Standard Steel Doors and Frames (SDI-100)*, ~~2017~~ 2023 .

Submitter Information Verification

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Submittal Date: Fri May 03 16:25:56 EDT 2024

Committee Statement

Committee Statement: Reference publication update.

Response Message: SR-10-NFPA 909-2024

Second Revision No. 11-NFPA 909-2024 [Section No. N.1.2.9]

N.1.2.9 UL Publications.

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

UL 263, *Fire Tests of Building Construction and Materials*, 2011, revised ~~2021~~ 2022 .

UL 294, *Access Control System Units,*~~2018~~ 2023 .

UL 305, *Panic Hardware,* 2012, revised 2022.

UL 437, *Key Locks,* 2013, revised ~~2017~~ 2023 .

UL 634, *Connectors and Switches for Use with Burglar-Alarm Systems*, 2007, revised 2020.

UL 681, *Installation and Classification of Burglar and Holdup Alarm Systems,* 2014, revised ~~2020~~ 2021 .

UL 768, *Combination Locks,* 2006, revised ~~2018~~ 2023 .

UL 1034, *Burglary-Resistant Electric Locking Mechanisms,* 2011, revised 2020.

UL 2058, *Outline of Investigation for High Security Electronic Locks,* 2005, revised 2013 .

Submitter Information Verification

Committee: CUL-AAA
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Committee Statement

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Response Message: SR-11-NFPA 909-2024

Second Revision No. 12-NFPA 909-2024 [Section No. N.2.1]

N.2.1 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 80A, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures*, ~~2017~~ 2022 edition.

Marchant, E. W. "Preventing Fire in Historic Buildings: The Acceptable Risk." *Fire Technology*, 25, no. 2 (May 1989): 165–176.

"Protecting Our Heritage, A Discourse on Fire Protection and Prevention in Historic Buildings and Landmarks," 2nd edition, 1970.

Submitter Information Verification

Committee: CUL-AAA
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Response Message: SR-12-NFPA 909-2024

Second Revision No. 17-NFPA 909-2024 [Section No. N.3]

N.3 References for Extracts in Informational Sections.

NFPA 4, *Standard for Integrated Fire Protection and Life Safety System Testing*, ~~2021~~ 2024 edition.

NFPA 72®, *National Fire Alarm and Signaling Code®*, 2022 edition.

NFPA 730, *Guide for Premises Security*, 2023 edition.

NFPA 5000®, *Building Construction and Safety Code®*, ~~2021~~ 2024 edition.

Submitter Information Verification

Committee: CUL-AAA

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Committee Statement

Committee Statement: The revision updates the references for extracts in informational sections to the current editions.

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