

# Chapter 9: Museum Fire Protection

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## NPS Museum Fire Protection Overview

### NPS Museum Fire Protection Standards

Install automatic fire detection and alarm systems **and** automatic fire sprinkler and/or suppression systems in structures housing collections **or** consolidate collections in structures protected with automatic fire detection and alarm systems **and** automatic fire sprinkler and/or suppression systems **or** document the superintendent's decision not to install these systems or consolidate collections in writing in accordance with NPS Museum Fire Protection Standard (1).

Develop and implement a Museum Fire Section of the park Structural Fire Management Plan.

Conduct regular self-assessments for fire risk and include corrective actions in the Museum Mitigation Action Plan to remove or reduce fire hazards and vulnerabilities.

Store collections in a dedicated storage space, implement no smoking and hot work policies, house paper accession (and deaccession) book and folders in locking UL listed 350°F one-hour fire-resistive insulated filing cabinet, safe, or vault when not in use and store cellulose nitrate-based materials in accordance with fire safety guidelines.

### Fire Risk Assessment

Complete the NPS Checklist for Preservation and Protection of Museum Collections and update every five years, as well as the Risk Assessment Worksheet. Arrange for a Fire Protection Condition Assessment of structures housing collections, to be conducted by a structural fire protection professional.

Develop and implement a Museum Mitigation Action Plan to remove or reduce fire hazards to collections and structures housing collections in collaboration with the Park Structural Fire Coordinator (PSFC), facility manager, Authority Having Jurisdiction (AHJ) or Regional Structural Fire Manager (RSFM), and interdisciplinary team. Review the plan annually and update every five years.

### Determining Museum Automatic Fire Protection Needs

Determine museum automatic fire protection needs in consultation with the PSFC, AHJ or RSFM, regional curator, and interdisciplinary team.

Work with the facility manager to develop FMSS work orders, PMIS statements, and funding requests for automatic museum fire protection systems.

Identify special fire protection considerations for collections and structures housing collections in consultation with the local fire department.

### Fire-Safe Practices and Design

Store museum collections in a dedicated storage space with automatic fire protection systems and appropriate fire-rated assemblies. Containerize collections in well-sealed steel cabinets and mobile compact storage systems. Use fire-resistant materials in structures and in spaces housing collections.

Implement fire-safe practices in storage and on exhibit, no smoking and hot work policies, and open flame guidance in structures housing collections. Store the accession book, cellulose nitrate-based materials, and flammable and combustible materials in accordance with fire safety guidelines. Regularly maintain utilities, equipment and appliances.

### Fire Protection Systems and Equipment

Work with the AHJ or RSFM and interdisciplinary team to identify, design, select, and install automatic fire detection and alarm systems and automatic fire sprinkler and/or suppression systems in structures housing museum collections in accordance with NPS Museum Fire Protection Standard (1) (MHI 9.B.1.1).

Inspect, test, and maintain automatic fire detection and alarm systems, automatic fire sprinkler and/or suppression systems, and portable fire extinguishers regularly.

### Museum Fire Section of the Park Structural Fire Management Plan

Develop and implement a Museum Fire Section of the park Structural Fire Management Plan (SFMP) in consultation with the PSFC and facility manager. Review annually and update every five years.

Restrict distribution of sensitive object information and floor plans in the Museum Fire Section of the park SFMP.

### Fire Emergency Response and Salvage

Implement fire Emergency Response Steps. Implement salvage procedures after the fire scene is cleared for entry.

### Training, Drills, and Documentation

Conduct regular fire drills and ensure staff complete annual fire extinguisher training.

Document all museum fire protection activities.

# CHAPTER 9: MUSEUM FIRE PROTECTION

## A. Overview

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Fire is a major threat to museum collections. It can destroy or irreparably damage irreplaceable collections and structures housing collections within minutes. Effective fire protection includes prevention, detection, and suppression of fire to prevent ignition and fire spread. Implementation of museum fire prevention and protection policies and plans, fire-safe practices and design, and the installation of automatic museum fire protection systems and portable fire extinguishers are critical to life safety and the protection of collections and structures housing collections.

### 1. What is included in this chapter?

This chapter covers museum fire planning and protection for collections and structures and spaces housing collections. It includes (in order of appearance in the chapter):

- *National Park Service (NPS) Museum Fire Protection Standards*  
Section B: NPS Museum Fire Protection Standards and Policies
- *Risk assessments* to identify fire hazards and vulnerabilities  
Section C: Fire Risk Assessment
- *Museum Mitigation Action Plan* that includes corrective actions implemented to remove or reduce fire hazards and vulnerabilities  
Section C: Fire Risk Assessment
- *Determining museum automatic fire protection needs*  
Section D: Determining Museum Automatic Fire Protection Needs
- *Fire-safe practices and design*  
See Section E: Fire-Safe Practices and Design
- *Overview of automatic fire detection and suppression systems and equipment*, including inspection, testing, and maintenance  
Section F: Fire Protection Systems and Equipment
- *Overview of portable fire extinguishers*  
Section F: Fire Protection Systems and Equipment
- *Sample Museum Fire Section of the park Structural Fire Management Plan*  
Section G: Museum Fire Section of the Park Structural Fire Management Plan and Figure 9.4: Sample Museum Fire Section of a Park Structural Fire Management Plan
- *Fire Emergency Response Steps and salvage procedures*  
Section H: Fire Emergency Response and Salvage and Figure 9.9: Fire Emergency Response Steps
- *Training, drills, and documentation* for museum fire protection  
Section I: Training, Drills, and Documentation
- *Figures and templates* for customization by parks

This chapter does not address fire prevention, protection and suppression in laboratories and exhibit preparation areas. Wildland fires in parks are noted only in relation to structures housing collections. See [RM-18: Wildland Fire Management](#) for additional information.

Figure 9.1: Museum Fire Protection Cycle below provides a visual representation of the museum fire planning and protection process, including prevention, detection and suppression, and emergency response and salvage steps.

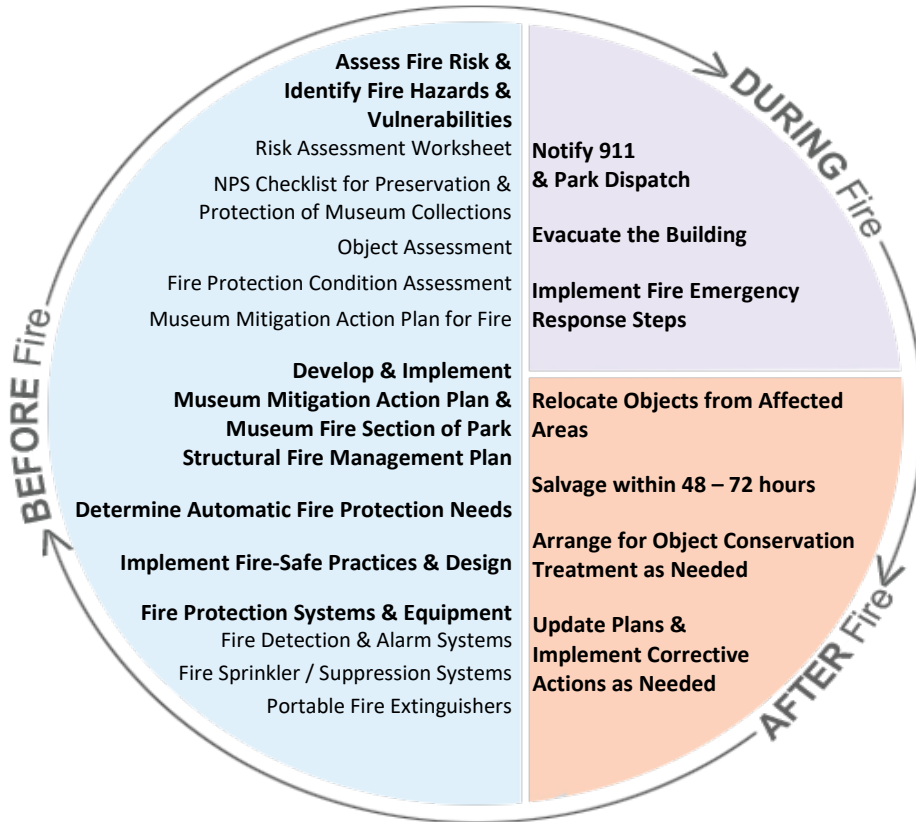


Figure 9.1 Museum Fire Protection Cycle

2. What terms are used in this chapter?

In this chapter:

- *Automatic fire protection system* refers to:
  - *automatic fire detection* (smoke and heat detectors) *and alarm systems*
  - and**
  - *automatic fire sprinkler systems* (water-based)
  - and/or**
  - *automatic fire suppression systems* (gaseous or “clean agent” based)

- *Portable fire extinguishers* (“fire extinguishers” or PFEs) refers to manually-operated devices (dry chemical or water-based) that are used to control small fires. They are used *with* automatic fire protection systems; they *are not* a substitute for automatic fire protection systems.
- *Structures housing collections* refers to museums, museum storage facilities, centers, furnished historic structures, spaces within buildings, visitor centers, and administrative offices housing collections.
- *Housing* refers to storing and/or exhibiting collections.
- *Collections* refer to museum objects, specimens, and associated records, archival items, paper and electronic museum records, and digital collection images.
- *Open flame* refers to lit candles, lanterns, fires in open fireplaces and hearths, lit matches, lighters, and smoldering dry materials.

See Section L: Glossary.

3. *Who is responsible for museum fire protection?*

All National Park Service staff are responsible for preventing fire, including permanent and seasonal employees, volunteers, interns, concessionaires, and partner and friends groups.

The *superintendent* or center chief has overall responsibility for preserving and protecting the park’s museum collection, including fire protection. The *curator*, as designated custodial officer, is directly responsible for the physical care of, and has day-to-day on-site responsibility for the museum collection and its fire protection needs. In this chapter, “curator” refers to the museum curator or collateral duty staff designated as responsible for the collection.

As designated by the superintendent, the *Park Structural Fire Coordinator (PSFC)* is responsible for implementing [Director’s Order \(DO\) 58: Structural Fire Management](#), [Reference Manual \(RM\) 58: Structural Fire Management](#), and the Park’s Structural Fire Management Plan (SFMP).

The *Authority Having Jurisdiction (AHJ)* is the fire and life safety technical resource responsible for enforcing nationally recognized fire codes. The AHJ may also be called the Fire Code Official (FCO). The AHJ is usually the *Regional Structural Fire Manager (RSFM)*, and is referred to as “AHJ or RSFM” in this chapter. The AHJ or RSFM arranges for the completion of a Fire Protection Condition Assessment (FPCA) that should include collections and structures housing collections at each park.

The park *facility manager* works with the PSFC, AHJ or RSFM, and curator to implement the Museum Mitigation Action Plan, work on

funding requests, and arrange for the installation, maintenance and inventory of automatic fire protection systems for structures housing collections.

The *interdisciplinary team* for museum fire protection includes the curator, AHJ or RSFM, PSFC, park facility manager, park wildland Fire Management Officer, chief of cultural resources, park Physical Security Coordinator, and the regional curator, historical architect advisor, cultural landscape specialist, conservator, and other specialists as needed. The interdisciplinary team should meet regularly to discuss upcoming and ongoing projects, compliance, and related issues to ensure collaboration on fire protection activities.

4. *What are the curator's responsibilities for museum fire protection?*

The curator is responsible for working with the interdisciplinary team to:

- Develop and implement the following for fire protection:
  - Risk Assessment Worksheet  
[Figure 10.2](#)
  - NPS Checklist for Preservation and Protection of Museum Collections  
[Appendix F, Figure F.2, Section F: Fire](#)
  - Museum Mitigation Action Plan  
[Figure 10.3](#)
  - First Priority Criteria for Object Relocation and Salvage  
[Figure 10.20](#)
  - Object Assessment  
[Figure 9.3](#)
  - Museum Fire Section of the park SFMP  
[Figure 9.4](#)
  - Fire Emergency Response Steps  
[Figure 9.9](#)
- Work with the PSFC and AHJ or RSFM to:
  - include structures housing collections in the FPCA conducted by a structural fire protection professional
  - select, install, and maintain automatic fire detection and alarm systems and automatic fire sprinkler and/or suppression systems in structures housing collections in accordance with NPS Museum Fire Protection Standard (1) (*Museum Handbook I*, Chapter 9.B.1.1 [MHI 9.B.1.1]), in collaboration with the park facility manager
  - select appropriate portable fire extinguishers

Note: Collateral duty staff responsible for museum collections must work with the regional curator when selecting and installing automatic fire protection systems for collections.

5. *Can I work with other parks to develop a museum fire protection strategy?*

Yes. Parks with collateral duty staff responsible for museum collections or that are understaffed should work collaboratively with center and/or neighboring park staff with appropriate expertise and the regional office to develop and implement a museum fire protection strategy for the park. This includes fire risk assessment, planning, prevention, mitigation, response, and salvage.

6. *What are potential fire hazards to museum collections?*

Most structural fires are caused by human activity or carelessness. They can occur due to failure to correct one or more of the deficiencies and hazards listed below in Figure 9.2: Fire Hazards to Museum Collections.

Category	Specific Fire Hazard
Civil Disturbances and Crime	<ul style="list-style-type: none"> <li>– Arson</li> <li>– Terrorist attack</li> <li>– Vandalism</li> </ul>
Construction and/or Maintenance	<ul style="list-style-type: none"> <li>– Poorly installed and/or maintained automatic fire detection and alarm, automatic fire sprinkler and/or suppression, HVAC, and electrical systems</li> <li>– Inappropriately modified fire detection and alarm systems and sprinkler and/or suppression systems</li> <li>– Use of High Density Polyethylene (HDPE) building materials</li> <li>– Careless hot work</li> <li>– Faulty or deteriorated electrical and mechanical systems, lighting, and installation</li> <li>– Improperly disposed chemicals</li> <li>– Deferred maintenance</li> </ul>
Museum and Park Operations (Procedural)	<ul style="list-style-type: none"> <li>– Absence of fire-safe practices and design</li> <li>– Smoking</li> <li>– Open flames in or near structures housing collections</li> <li>– Appliances left on, improperly used, or in poor condition</li> <li>– Inappropriately housed flammable liquids and hazardous collections</li> </ul>
Emergency Incidents	<ul style="list-style-type: none"> <li>– Earthquake</li> <li>– Hazardous materials spill, exposure, and explosion</li> <li>– Power outage</li> <li>– Severe weather, including lightning strike</li> <li>– Volcanic eruption</li> <li>– Wildland fire</li> </ul>

**Figure 9.2 Fire Hazards to Museum Collections**

7. *What do I need to know about fire protection systems in furnished historic structures?*

Many historic structures are extremely vulnerable to fire due to their design, building materials and components. Without automatic fire protection, furnished historic structures and their contents are at serious risk of damage or total destruction from fire. Many furnished historic structures and the collections on exhibit in these structures are mission-critical. To protect collections *and* the historic structure, install and maintain an automatic fire detection and alarm system *and* an automatic fire sprinkler and/or suppression system in accordance with NPS Museum Fire Protection Standard (1.a) (MHI 9.B.1.1.a).

The curator should work with the regional curator, historical architect



advisor, and AHJ or RSFM to ensure that the selection and installation of minimally invasive automatic museum fire protection systems respects the character defining features of the structure. Installation of these systems in furnished historic structures must be in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties, Section 106 of the National Historic Preservation Act of 1966, and the Programmatic Agreement with the National Council of State Historic Preservation Officers (NCSHPO).

8. *What sources of assistance are available?*

Consult the PSFC, AHJ or RSFM, and regional curator for assistance and information on fire risk assessment, planning, prevention, mitigation, automatic fire detection, suppression, and safety self-inspections. Other contacts include:

- [NPS Structural Fire Program](#), National Interagency Fire Center (NIFC), Boise, ID.
- NPS, Department of the Interior (DOI), and contract structural fire protection professionals.
- Regional, county, and state fire marshal's offices and fire prevention bureaus.
- Museum fire specialists.

See [NPS Structural Fire](#).

**B. NPS Museum Fire Protection Standards and Policies**

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National Park Service standards and policies included below form the basis of the park's museum fire protection program and apply to collections housed in NPS and non-NPS structures and repositories.

1. *NPS Museum Fire Protection Standards*

Implement the following NPS Museum Fire Protection Standards in structures housing collections.

1. (a) Install automatic fire detection and alarm systems *and* automatic fire sprinkler and/or suppression systems in all purpose-built and adapted structures and spaces housing or exhibiting museum collections as approved by the AHJ or RSFM in consultation with the park or regional museum curator and interdisciplinary team. In furnished historic structures, select and install automatic fire detection and alarm systems *and* automatic fire sprinkler and/or suppression systems as approved by the AHJ or RSFM in consultation with park and regional facilities management staff, the historical architect advisor, and the park or regional museum curator.

*or*

- (b) Consolidate collections in structures protected with

automatic fire detection and alarm systems *and* automatic fire sprinkler and/or suppression systems.

*or*

(c) The decision not to use these systems must be made by the superintendent or delegate in consultation with the AHJ or RSFM, park curator, regional curator, and historical architect advisor as appropriate, using information from Figure 9.3: Object Assessment and the Museum Collections Assessment Matrix and Historic Property Assessment Matrix in RM-58.7.A.

This decision must be documented in writing using Figure 9.3a: Record of the Superintendent's Decision Regarding Installation of Automatic Fire Protection Systems and Consolidation of Collections. Copies of the documents noted in NPS Museum Fire Protection Standard (1.c) must be distributed to the AHJ or RSFM, regional director, regional curator, the park central and museum files, and the historical architect advisor if appropriate.

2. Develop and implement a Museum Fire Section as part of the park Structural Fire Management Plan (SFMP) with procedures to prevent, detect, and suppress fires. Review annually and update the Museum Fire Section every five years and after a structural fire incident, addition of a new or renovated structure to house collections, new exhibit installation, or change in curator.
3. Conduct regular self-assessments for fire risk, including the NPS Checklist for Preservation and Protection of Museum Collections, and have a structural fire protection professional complete a Fire Protection Condition Assessment (FPCA) for structures housing museum collections.
4. Include and implement corrective actions to remove, reduce, and/or mitigate fire hazards and vulnerabilities in the Museum Mitigation Action Plan.
5. House museum collections in a dedicated storage space separated from the curatorial office, research and work areas, and supply storage areas.  
  
House collections in spaces separated (compartmented) by appropriate fire-rated assemblies in purpose-built and adapted structures and spaces, and separate functions to the extent possible in furnished historic structures.
6. Prohibit smoking in or within 25 feet of structures and spaces housing collections.
7. House the paper accession (and deaccession) book and folders in a locking UL listed 350°F one-hour fire-resistive insulated filing cabinet, safe, or vault when not in use. House

electronic museum records, backups, and other media files in a UL listed 125°F one-hour fire resistive media safe or box.

8. Store cellulose nitrate-based materials in accordance with fire safety guidelines and Director’s Order 24.4.3.23: Cellulose Nitrate and Cellulose Ester Film.
9. Require a Hot Work Permit (HW-1) for hot work in spaces housing collections. Protect collections or move to a secure location during hot work.

2. *DOI Museum Property Directive #4: Required Standards for Managing and Preserving Museum Property*

**1.8 Fire Protection Standards.** “Equipment and/or systems must be installed to detect and suppress fire in storage and exhibit spaces that house museum collections. General requirements are to:

- A. Address in a fire plan the needs of museum collections, including objects and archives, when fire is being prevented, detected, and/or suppressed.
- B. Select systems appropriate to the nature of the museum collections in the space and for the structure in which the objects are housed.
- C. Make spaces that house museum collections fire-resistant to the extent possible.
- D. Store museum records, including records in electronic format, in appropriate fire resistant containers, vaults, or secure off-site facilities, and keep the containers secured when not in use.
- E. Prohibit flammable liquids in any area that houses museum collections, except where flammable liquid is a component of the museum object such as natural history specimens stored in jars containing alcohol.”

3. *NPS Management Policies*

**5.3.1.2 Fire Detection, Suppression, and Post-fire Rehabilitation and Protection:** “...Smoking will not be permitted in spaces housing museum or library collections or in historic structures...”

**9.1.8 Structural Fire Protection and Suppression:** “Fire prevention, protection, and suppression will be primary considerations in the design, construction, rehabilitation, maintenance, and operation of all facilities. Structural fires will be suppressed to prevent the loss of human life and minimize damage to property and resources...”

Each superintendent will complete a structural fire assessment and develop a structural fire plan to meet park needs...Prevention priorities will focus on occupied structures and cultural resources, ...code compliance, early warning detection, suppression systems, and employee training...

Fire prevention through code-compliant new construction, upgrading of existing structures, ...scheduled fire inspections, and properly installed and maintained detection and suppression systems will be the primary means of addressing...deficiencies...”

**9.4.2 Museum Collections Management Facilities:** “...Curatorial facilities will meet each collection’s special requirements for

security, fire suppression, and environmental controls...”

4. *NPS Director's Orders (DO)*

**DO 24: NPS Museum Collections Management:**

**4.3.10: Emergency Operation:** “Approve, keep current, and implement a Museum Collections Emergency Operations Plan, as part of the park's Emergency Operations Plan... identifying museum collection vulnerabilities to events (such as fire...) and responses that will protect resources without endangering human health and safety...”

**DO 50D: Smoking Policy:**

**4.1.1:** “[S]moking is prohibited...[w]ithin 25 feet of any entrance or exit ...where smoking would result in smoke traveling through doorways, windows, air ducts or other openings.”

**DO 58: Structural Fire Management:**

**V.A: Planning**

“1. Each superintendent will ensure the completion of a comprehensive Fire Protection Condition Assessment (FPCA) on buildings... and the development of a Structural Fire Management Plan (SFMP) in accordance with guidelines and procedures outlined in RM-58 (RM-58)...

2. The installation, inspection, and maintenance of all fire detection and suppression equipment are performed and documented in accordance with statutory and regulatory requirements, applicable NFPA standards, and all applicable NPS Directors Orders and Reference Manuals.

3. Changes recommended by SFMPs that involve historic structures or historic landscapes will comply with State Historic Preservation Office requirements.”

**V.D: Cultural Resources**

“4. Buildings with collections, or as determined by the AHJ, will be provided early warning detection and suppression systems based on NFPA codes and standards and DOI and NPS policies.

5. Automatic suppression systems and detection equipment will comply with the requirements in RM-58.”

5. *NPS-28: Cultural Resource Management Guideline*

**NPS-28: Cultural Resource Management Guideline**

**Chapter 4.D.1: Structural Fire:** “A structural fire plan treating prevention, detection, and suppression, including special procedures for fighting fire in historic structures and structures housing museum property, is required for each park...”

**Chapter 9.B.3.b: Cataloging:** “All paper museum records (e.g., accession book, accession file, catalog records) are kept in a locking, insulated file. Magnetic media (e.g., disks, tapes) that back up (ICMS) data files and other collection data files are stored in an appropriately rated container (e.g., media safe, media file, mixed media file, media box).”

6. *NPS Reference Manual 58: Structural Fire* NPS [Reference Manual 58: Structural Fire \(RM-58\)](#) provides guidance on implementing structural fire management policy for the National Park Service, including performance-based design solutions for historic structures and spaces housing collections.
- See NPS 58 Chapter 6: Structural Fire Prevention and Fire Code Compliance, Chapter 7: Fire Protection for Historic Structures and Buildings with Collections, and Chapter 7, Appendix A: Structural Fire Protection of Cultural Resources in the NPS.
7. *National Fire Protection Association (NFPA) and nationally recognized fire codes* Fire and life safety inspections, building construction, inspection, testing, and maintenance of fire protection systems, and other fire code compliance issues are based on applicable codes that include NFPA 909: *Code for the Protection of Cultural Resource Properties – Museums, Libraries, and Places of Worship* and NFPA 914: *Code for Fire Protection of Historic Structures*, as described in DO 58 and RM-58.
- See Section J: Selected Bibliography for a list of specific nationally recognized fire codes for protecting structures and life safety.

## C. Fire Risk Assessment

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1. *What is risk assessment?* Risk assessment identifies possible ways losses can occur by analyzing the severity of an event, its probability of occurrence, and exposure to hazards and vulnerabilities. Risk assessment for fire involves:
- Identifying fire hazards and vulnerabilities, including which structures and objects are most likely to be lost or damaged by fire.
  - Evaluating the likelihood of fire damage due to the:
    - composition and condition of the collection (such as wet or fluid-preserved specimens or high fuel load items)
    - nature and/or condition of structures housing the collections (such as wood or plaster)
    - condition of mechanical and electrical systems
    - presence or absence and condition of functioning automatic fire detection and alarm systems
    - presence or absence and condition of functioning automatic fire sprinkler and/or suppression systems
    - location within the wildland-urban interface
    - availability of water supply and ability of the fire department to quickly arrive at and control the fire

See Question E.22: Wildland fire protection and Chapter 10.B.1: What is risk assessment? See also [Business Practices: Risk Assessment Codes](#), developed by the NPS Park Facilities Management Division.

2. Which fire risk assessment tools do I use to identify fire hazards and vulnerabilities?

The curator should conduct self-assessments to identify deficiencies, hazards, and vulnerabilities in the collection and structures housing collections, in consultation with a structural fire protection professional and the facility manager. These include:

- **Risk Assessment Worksheet** with a focus on the threats from fire (Chapter 10: Emergency Planning, [Figure 10.2](#)) should be completed by the curator every five years, or after a significant fire event, construction or renovation, large new acquisition(s), installation of a new exhibit, or change in the curator. It should be reviewed annually. This is a fillable worksheet.
- **NPS Checklist for Preservation and Protection of Museum Collections** (Appendix F, [Figure F.2](#)), reviewed and submitted to the National Catalog annually in accordance with DO 24.5.2: Checklist and updated every five years in accordance with DOI Museum Property Directive 14.1.5.B: *Facility Checklist for Spaces Housing DOI Museum Property*.
- **Object Assessment** ([Figure 9.3](#)) should be completed to support the decision to install automatic museum fire protection systems or relocate “first priority” objects (see [Figure 10.20: First Priority Criteria for Object Relocation and Salvage](#)) to a safe separate space where these systems are installed. It is used together with the RM-58 Chapter 7, Appendix A Museum Collections Assessment Matrix. This is a fillable form.

3. What is the Fire Protection Condition Assessment?

The **Fire Protection Condition Assessment (FPCA)** is a risk-based inspection of fire and life safety systems and processes for buildings, including structures housing collections. It is conducted by a structural fire protection professional to document code compliance of buildings (structures) and risks to life safety, buildings, and contents, including collections. The FPCA is completed as needed. Request a new or updated FPCA if conditions have changed.

The **Fire Safety Assessment** in RM-58.7, Appendix A, is completed by the structural fire protection professional when conducting a FPCA.

4. What is included in the Statement of Work for a Fire Protection Condition Assessment?

Work with the AHJ or RSFM to develop a Statement of Work (SOW) to obtain a FPCA for structures housing collections. The SOW should specifically address risks to collections and meet or include the following requirements:

- The structural fire professional conducting the FPCA must be a qualified fire protection specialist.
- Work must address the needs of the collections and structures housing collections.

- Attachment to the FPCA Statement of Work: FPCA Questions Related to Museum Spaces (Figure 9.6a).
- The structural fire protection professional must work with the curator to incorporate Section B of the Object Assessment (Figure 9.3) in the final FPCA assessment report.

See [Figure 9.6](#): Sample Statement of Work for a Fire Protection Condition Assessment (FPCA).

5. *What fire protection corrective actions should the Museum Mitigation Action Plan include?*

The curator generates corrective actions for fire protection from deficiencies identified in the Checklist, Risk Assessment Worksheet, and FPCA for inclusion in the Museum Mitigation Action Plan. These corrective actions cover storage, exhibit, and work spaces in structures housing collections. The Museum Mitigation Action Plan is implemented in collaboration with the facility manager, PSFC, AHJ or RSFM, Physical Security Coordinator, and regional curator. Work with the historical architect advisor when implementing fire prevention strategies, including performance-based design alternatives, in furnished historic structures.

Keep the Museum Mitigation Action Plan current, review annually, and update every five years and after a significant structural fire incident, addition of a new or renovated structure to house collections, new exhibit, or change in the curator. Group corrective actions by mitigation area. Prioritize as immediate, intermediate, or long-term. *Remember*: the museum fire protection plan is only effective when implemented.

See Question 10.C.1: What is the Museum Mitigation Action Plan?, Figure 10.3: Sample Museum Mitigation Action Plan, and RM-58.7, Appendix A.4: A Park-Based Process for Planning the Fire Protection of Historic Structures and Park Collections.

**D. Determining Museum Automatic Fire Protection Needs**

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1. *How do I determine which structures housing collections should have automatic fire protection systems?*

In consultation with the PSFC and AHJ or RSFM, the curator evaluates information from Figure 9.3: Object Assessment and RM-58.7, Appendix A: Structural Fire Protection of Cultural Resources to:

- Determine in which structure(s) to install an automatic fire detection and alarm system and an automatic fire sprinkler and/or suppression system.
- Determine which automatic fire protection systems are appropriate to the nature of the collection and structures housing collections and the level of fire protection to be provided, including where recommendations may exceed code

requirements.

- Design and install these automatic systems in structures housing collections.

The decision *not* to use these systems must be made by the superintendent or delegate in consultation with the AHJ or RSFM, park curator, regional curator, and historical architect advisor as appropriate, using information from the Object Assessment and the Museum Collections Assessment Matrix and Historic Property Assessment Matrix in RM-58.7.A. This decision must be documented in writing using the Record of the Superintendent's Decision Regarding Installation of Automatic Fire Protection Systems and Consolidation of Collections (Figure 9.3a). Distribute a copy of these documents to the AHJ or RSFM, regional director, regional curator, the park central and museum files, and the historical architect advisor if appropriate.

2. *What information is needed to determine automatic fire protection system needs and who generates this information?*

The curator, PSFC or specialist, and the facility manager, in consultation with the interdisciplinary team, are responsible for generating information and completing the documents noted below to determine automatic fire protection system needs for collections and structures housing collections.

The *curator* completes the Risk Assessment Worksheet (Figure 10.2), NPS Checklist for Preservation and Protection of Museum Collections, Section F: Fire Protection (Appendix F, Figure F.2), and Object Assessment (Figure 9.3).

The *structural fire protection professional* completes the FPCA and the Fire Safety Assessment.

The *PSFC or specialist*:

- Provides fire protection system condition information from the FPCA and recommendations for fire protection in structures housing collections.
- Completes the following from RM-58.7, Appendix A: Structural Fire Protection of Cultural Resources in the National Park Service:
  - Museum Collections Assessment Matrix
  - Historic Property Assessment Matrix, where appropriate
  - Appendix A.4: A Park-Based Process for Planning the Fire Protection of Historic Structures and Park Collections, when alternative performance-based design solutions for furnished historic structures are needed



The *facility manager*:

- Generates information on:
  - availability of sufficient physical resources such as power and water
  - availability of back-up generators
  - existing systems and controls in structures housing collections, including HVAC systems
  - facility operations and maintenance funding, including life-cycle costs
- Develops FMSS work orders and PMIS statements to install, upgrade, maintain, and/or replace automatic fire protection system equipment to protect collections and structures housing collections.

3. *How is museum fire protection mitigation funded?*

Work with the facility manager, PSFC, the Contracting Officer's Representative (COR), regional curator, and regional fee and business office to obtain funding for museum fire protection mitigation projects. Sources of funding include cyclic maintenance, equipment replacement, repair and rehabilitation (RERE), the recreation fee program, and other sources.

Information obtained from risk assessments, the FPCA, and the Museum Mitigation Action Plan is used to generate a *work order* for installation of automatic fire protection systems using the *Facility Management Software System (FMSS)*. Work with the facility manager and PSFC to ensure that all *location information* in FMSS for structures housing collections is up-to-date and accurate.

FMSS work orders are entered into the *Project Management Information System (PMIS)* to request and obtain funding for the installation of automatic fire protection systems.

4. *What special considerations should be addressed with the local fire department?*

The local fire department is generally best equipped to respond to fires that impact collections. The curator should collaborate with the PSFC to establish a relationship with the local fire department or equivalent organization to inform them of the special needs of collections, structures housing collections, and furnished historic structures when fighting fires.

Work with the PSFC to ensure the local fire department has the expertise, equipment, and/or staffing to meet museum fire protection needs and take the actions noted below.

- Establish a formal or informal agreement for mutual cooperation with the primary local fire department to provide fire protection for each structure housing collections. Formal agreements include Memoranda of Agreement (MOA) and Memoranda of Understanding (MOU) that include language

from [Figure 9.5](#): Sample Museum Fire Protection Language for Inclusion in a Memorandum of Understanding between a Park and a Fire Company.

- The local fire department should develop a pre-fire plan outlining the department's fire response procedures for each structure housing collections that includes:
  - minimum response time
  - minimum staffing level
  - level of coverage (day, night, weekend)
  - rapid entry alternatives
  - utility shutoff locations
  - equipment and training needed to fight fires involving collections and structures housing collections, including furnished historic structures
  - procedures for contacting the next-closest provider if unavailable
- Tour fire department members through collections storage, work, and exhibit areas, including furnished historic structures, and:
  - discuss the use of fire hoses and other suppression activities to prevent damage to collections
  - identify access points to avoid damaging character defining features of historic structures housing collections
  - indicate which collections need to be protected in place
  - conduct annual orientation training
  - identify potentially hazardous or flammable collections and non-collection materials
- Provide the fire department with pertinent sections of the Museum Fire Section and floor plans of structures housing collections, including locations of:
  - access routes
  - utility shut offs, including sprinkler shut-off valves and alarm system annunciator panels
  - utility risers
  - sensitive or hazardous objects or areas such as wet specimen storage and/or hazardous non-collection materials
- The local fire department is responsible for requesting additional assistance as needed.

See [RM-58.14: Agreements and Contracts](#) for sample agreements.

## E. Fire-Safe Practices and Design

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Fire-safe practices and design in storage, work, and exhibit spaces are critical to preventing ignition and the spread of fire. Work with the PSFC, AHJ or RSFM, facility manager, interdisciplinary team, regional curator, and a fire specialist, to implement fire safe practices, design, and operational procedures to remove, reduce, or mitigate fire hazards and vulnerabilities.

### 1. *Fire-safe collections care in storage*

Best practices in collection storage and workspaces minimize fire risk. They are essential to life safety and collections protection. Implement best practices described in this *Handbook* and:

- House collections in dedicated storage spaces with automatic fire protection systems.
- Perform collections processing and preparation separately from collections storage areas.
- Store collections in:
  - well-sealed locking steel cabinets that are closed and secured after use and at the end of each day
  - cabinets and shelving no closer than 18 inches from sprinkler head deflectors
  - cabinets and shelving raised 4 – 6 inches off the floor
  - appropriate containers for works on paper and archival items
- Store oversized objects off the floor.
- Practice good housekeeping and:
  - keep storage areas housing collections free of clutter
  - maintain clean and organized storage and work spaces
  - empty trash receptacles daily
  - keep equipment vents, electrical outlets and wiring, and pipes unobstructed
  - keep portable fire extinguishers unobstructed
  - keep doors and windows closed
- Store collections away from vents or flammable and combustible chemicals.
- Close and store containers of chemicals such as alcohol or Paraloid™ B-72 used in collections preparation after use.
- House non-collections storage materials such as boxes, paper, and packing materials separately from collections.

## 2. *Mobile compact storage system fire safety*

Mobile compact storage systems (compactors) eliminate fixed aisles and expand a room's storage capacity by as much as 40%. These systems may be manually (mechanically) or electronically operated. The high density of objects stored in compactor carriages increases the fuel load and requires specialized fire protection design considerations. Be aware that wiring in electronically operated systems may pose an increased risk of ignition from sparking.

Provide openings between carriages when the system is closed and not in use to increase the capability to detect and suppress fire. Be aware that these spaces increase exposure to agents of deterioration and reduce the space savings these systems provide. Consult with a qualified structural fire protection engineer experienced with collections and the regional curator when designing and installing automatic fire protection systems in spaces with compactors.

Take the following fire safety precautions when designing and installing a mobile compact storage system:

- Fully enclose carriages, including solid steel tops, backs, and longitudinal and transverse dividers to slow fire spread.
- Provide openings of a minimum of four inches between carriages to allow for penetration by sprinkler or suppression systems when the compactor is not in use and:
  - design openings in the footprint for new systems
  - use bumpers to provide openings for existing and new systems
- Base automatic fire protection system capacity to effectively detect and suppress fire on:
  - composition of objects (paper, wood, baskets, wet specimens, etc.)
  - density of objects stored in the system
  - carriage height
  - system type (manually or electronically operated)
- Include the following automatic fire protection systems:
  - Very Early Warning Smoke Detection Apparatus (VESDA) detection system
  - quick response wet pipe or single-interlock pre-action sprinkler system
- Space sprinkler heads with sufficient density and set to open at an appropriate temperature as designed by a fire protection professional with concurrence from the AHJ or RSFM.

- Ensure carriage tops are not closer than 18 inches from sprinkler head deflectors.
- Do not store anything on top of the carriages. Post a sign in the space stating “No storage on the top of the unit” in accordance with nationally recognized fire codes.

### 3. *No smoking policy*

In accordance with NPS Management Policies (2006) 5.3.1.2, “Smoking will not be permitted in spaces housing museum or library collections...”

- Prohibit smoking:
  - within structures housing collections
  - within 25 feet of the entrance to the building
  - in front of or near air intake ducts
  - in exterior spaces adjacent to structures housing collections
- Post “No Smoking” signs at entrances to structures housing collections.
- Provide appropriate receptacles for the disposal of discarded tobacco materials at all approved smoking areas.

See [310 DM 11](#): Smoking in Public Buildings, [DO 50D](#): Smoking Policy, and [Executive Order 13058](#): Protecting Federal Employees and the Public from Exposure to Tobacco Smoke in the Federal Workplace.

### 4. *Open flame guidance*

Open flames include lit candles, lanterns, fires in open fireplaces and hearths, and lit matches, lighters, and smoldering of dry materials. Open flames used in and immediately adjacent to structures or spaces housing collections pose an extreme fire risk.

***DO NOT use open flames in structures housing collections to avoid the risk of fire.***

- Conduct all activities using open flames outside structures housing collections and:
  - have park staff monitor open flames at all times
  - arrange for a portable fire extinguisher at the site of any open flame activity adjacent to structures and spaces housing collections
- ***Do not*** use open flames in historic structures housing collections, including fireplaces.
- Perform demonstrations such as cooking or blacksmithing well away from structures housing collections.
- Use fire-safe alternatives such as battery-operated flameless

LED candles and lanterns for events that take place in structures housing collections.

Select fire-safe alternates in consultation with the curator, facility manager, AHJ or RSFM, and interpretation and education staff. Be aware that certain flameless fireplace logs emit heat and are potential fire risks.

The lighting or burning of smoldering plant materials in activities such as smudging presents a major fire risk to collections and structures housing collections. Conduct all smudging activities in a designated space outside of and away from structures housing collections to avoid the risk of fire. Discuss smudging requests and fire-safe alternatives with tribal representatives, in consultation with the PSFC and regional curator.

See Question E.16: Hot work procedures.

5. *Consolidating collections*

*If* collections are to be consolidated in accordance with NPS Museum Fire Standard (1.b) (MHI 9.B.1.1.b), *then* an automatic fire detection and alarm system and automatic fire sprinkler and/or suppression system must be installed in the designated structure. This structure or facility may be housed elsewhere in the park or at a nearby park, center, or repository, and must meet fire protection and life safety standards.

6. *Housing flammable and combustible materials*

Flammable and combustible materials are found in a variety of sources including wet (fluid-preserved) specimens, specimen preparation, including casting and modeling materials, and housekeeping and building maintenance materials. Flammable liquids such as ethanol and isopropyl alcohol have a flash point below 100°F. Combustible liquids, such as formalin, have a flash point at or above 100°F. Ventilation is needed to prevent the accumulation and ignition of fumes from these materials.

Work closely with the AHJ or RSFM, PSFC, fire specialist, facility manager, and regional curator to:

- Install and maintain an automatic fire detection and alarm system, automatic fire sprinkler and/or suppression system, and portable fire extinguishers appropriate for suppressing a flammable liquids fire (Class B fire) in structures housing flammable and combustible materials.
- Determine appropriate fire rated assemblies, ventilation, run-off control procedures, and other requirements for structures housing flammable and combustible liquids in accordance with nationally recognized fire codes adopted by DO 58 and RM-58.
- Store bulk chemicals used in specimen preparation separately from collections in accordance with nationally recognized fire

codes and:

- house in flammable liquid storage cabinets of appropriate size and rating
  - label cabinets housing flammable and combustible liquids
  - do not exceed the capacities for individual chemical storage drums and other containers
  - regularly dispose of hazardous waste
- House ordnance and live ammunition in accordance with [Chapter 11: Curatorial Health and Safety](#).
  - Maintain an inventory of flammable, combustible, and hazardous materials and their safety data sheets (SDS).

#### 7. *Housing wet (fluid-preserved) specimens*

When housing wet or fluid-preserved specimens, follow guidance in Question 6: Housing flammable and combustible materials, and work closely with a fire specialist, the AHJ or RSFM, PSFC, and regional curator to:

- House wet specimens separated from other collections in:
  - well-sealed steel cabinets for a small volume of wet specimens
  - containers or jars with seals that are sufficiently tight to prevent the escape of flammable or combustible liquids and/or vapors
  - for a large volume of wet specimens, store separately in a space with a separate ventilation system
- Label rooms and spaces housing wet specimens.
- Identify wet specimen storage areas in the Museum Fire Section of the SFMP, including floor plans.

Note: NFPA 30 (2015).9.5.4: Flammable Liquids Storage Cabinets states: “Storage cabinets shall not be required by this code to be ventilated for fire protection purposes” and NFPA 30 (2015).9.5.4.1 states: “If a storage cabinet is not ventilated, the vent openings shall be sealed with the bungs supplied with the cabinet or with bungs specified by the cabinet manufacturer.”

See [Appendix Q.D.15: What problems may occur with fluid-preserved specimens?](#), [Appendix T.IV.D.3: Are there any special considerations for storing wet specimens?](#) and [T.IV.E.3: How are fluids lost or compromised?](#), and [COGs 2/18: Safe Storage And Handling Of Natural History Specimens Preserved In Fluid](#) and [11/3: Storage Concerns For Fluid-Preserved Collections](#).

#### 8. *Cellulose nitrate-based materials*

Cellulose nitrate-based materials are an explosion threat to collections and deteriorated cellulose nitrate-based materials are highly flammable. See [Appendix M: Management of Cellulose](#)

Nitrate and Ester Film and DO 24.4.3.23: Cellulose Nitrate and Cellulose Ester Film for information on how to handle and/or dispose of cellulose nitrate-based materials.

If there is cellulose nitrate remaining in the collection:

- Copy and inspect nitrate-based materials, and do not store in parks for longer than it takes to copy. Store in a facility with appropriate flammable materials storage freezer capability until copies are made.
- Isolate cellulose nitrate-based materials from the rest of the collection to prevent damage from off-gassing, preferably in off-site cold storage.
- If nitrate-based materials are to be stored in the park, place flammable materials storage freezers in properly vented spaces with appropriate warning labels and:
  - establish a temperature threshold for environmental alarms and have freezers monitored 24/7 by a monitoring station
  - ensure that the weight of nitrate negatives (minus packaging) in the freezer is below mandatory limits
  - ensure back-up power is available
- Work with a structural fire protection engineer and the AHJ or RSFM to ensure that automatic fire protection systems and construction, including appropriate fire-rated walls, are adequate for the amount of cellulose nitrate-based materials housed in accordance with RM-58.6 and NFPA 40: *Standard for the Storage and Handling of Cellulose Nitrate Film*.

See *COGs 2/20: Handling and Shipping of Cellulose Nitrate Film* and *14/8: Caring for Cellulose Nitrate Film*.

9. *Housing the accession (and deaccession) book and folders*

House the accession book and folders and the optional deaccession book and folders in a secure room in an insulated UL listed fire-resistant filing cabinet or vault that is locked when not in use, in accordance with NPS Museum Fire Protection Standard (7) (MHI 9.B.1.7).

- For *paper records*, use an insulated filing cabinet, safe, or vault with a UL listing of (350°F 1-hour).
- For *electronic museum records, backups, and other media files*, house in an insulated media safe or box with a UL listing of (125°F 1-hour).
- Make museum quality photocopies and digital scans of the accession (and deaccession) book and documents and store in a different location from the original and off-site. Deposit the



photocopies and electronic copies with the regional curator.

- Maintain up-to-date electronic museum records and other media files, and create regular electronic backups. Maintain a current copy of the backup in a secure off-site location.

See NPS-28: Cultural Resource Management Guideline 9.B.3.b: Cataloging and *Museum Handbook* Part II [Chapter 2.U.3](#): Should I store the accession book in a special place?

#### 10. Fire prevention for objects on exhibit

Minimize the risk of fire in exhibit areas, including visitor centers, museums, and furnished historic structures by implementing best practices described in this *Handbook* and:

- Ensure exhibit cases are not closer than 18 inches from sprinkler head deflectors.
- Work with facilities management to ensure that the HVAC intake for exhibit spaces is separated from intakes for other spaces in the structure to minimize spread of fire and/or smoke.
- Use fire-resistant and/or noncombustible materials for:
  - exhibit cases and platforms
  - interior finishes and flooring
  - seating areas
  - exhibit props and components, including artificial foliage and reconstructions of environments
- Use indirect LED lighting for objects enclosed in exhibit cases in accordance with *Museum Handbook* Part III.7.I.4: How do I balance exhibit lighting needs with preservation requirements?

See *Museum Handbook* Part III, [Chapter 7](#): Using Museum Collections in Exhibits.

#### 11. Fire prevention for objects on exhibit in furnished historic structures

Objects on exhibit in furnished historic structures pose special concerns. They are likely to be on open display and more susceptible to fire damage than objects in enclosed cabinets. To prevent fires in furnished historic structures, implement best practices as described in this *Handbook*, and:

- Keep exits and paths through furnished rooms clear and unobstructed.
- Display objects away from:
  - lighting that can cause heat buildup and ignition
  - drapes, windows, and other furnishings than can spread fire
- Work with facilities management to ensure that:

- electrical wiring is in good condition and well-maintained
- filters, exhaust ducts, and HVAC system components are well-maintained and cleaned frequently
- Use fire-resistant decorative materials such as banners, bunting, streamers, fabric, paper, cotton batting, and artificial vegetation.
- Use flame-retardant impregnated or treated fabrics and other materials in curtains, draperies, tarps, floor treatments such as ceramic tiles and carpets, and window treatments as appropriate.
- Keep doors to non-public areas of the structure closed to maintain compartmentation and prevent flame spread.

See *Museum Handbook* Part III, [Chapter 8](#): Using Museum Collections in Historic Furnished Structures.

**12. Seasonal, remote, and high risk location considerations**

Evaluate objects housed in seasonally-open or remote locations on a case-by-case basis. The curator should assess fire risk and whether objects should be relocated in consultation with the PSFC and regional curator. Be aware that repeated packing, handling, and relocation is likely to damage objects. However, if the object is determined to be high value based on the Object Assessment (Figure 9.3), it should be considered for relocation. If it is determined that the objects will remain *in situ*, the structure needs to be secure and free of fire risk. Electrical wiring needs to be in good condition, and electrical appliances removed.

If collections are housed in an area of high risk of wildland fire, follow precautions outlined in RM-18: Wildland Fire Management or consider relocating the collection to a safer location.

**13. Regular inspection and ongoing maintenance**

Regular inspection and ongoing maintenance are essential to fire protection. The curator should work with facilities management to ensure that the building envelope, structural elements such as walls and doors, utilities such as boilers and HVAC units, and electrical components such as wiring and fuses are in good working order.

**14. Electrical and mechanical equipment and appliances**

Work with facilities management to take the following precautions when using electrical and mechanical equipment and appliances:

- Ensure that all equipment and appliances are in good working order.
- Correct, repair, or replace defective or improperly installed components and overloaded circuits.
- In designated areas, use only:
  - electrical appliances with automatic shutoffs that are

- thermostatically controlled and UL approved, including coffee makers
  - appliances set on a noncombustible surface such as ceramic tile
  - UL listed personal heaters without open heating coils and with a tip-over switch
  - microwave ovens for warming and cooking food
- Switch off and/or disconnect heating and cooking appliances after use.
- Keep combustible items such as paper, cloth, or trash cans away from portable heaters.
- ***Do not:***
  - use hot plates, stovetops or ovens for cooking, and fuel-fired (kerosene) open-coil portable heaters within structures housing collections
  - use extension cords of any size with high wattage electrical appliances (coffee makers, microwaves, freezers, electric heaters, etc.), or as a substitute for permanent fixed wiring
  - overload surge-protected strip cords
- Designate break spaces well away from spaces housing collections.
- Arrange for periodic inspection of electrical appliances.
- Ensure electrical wiring is installed, inspected, and maintained by a professional electrician in accordance with NFPA 70: *National Electric Code*.

15. *Construction and renovation project precautions*

Many fires occur during construction and renovation projects. Work with the PSFC, facility manager, regional curator, and AHJ or RSFM to review plans, provide guidance, and minimize fire risk in accordance with RM-58.6.3: Construction, Planning, and Design Review.

***Keep automatic fire protection systems operational and exercise extreme caution during construction and renovation.***

Work with the PSFC to include the precautions listed below in the SOW for construction and renovation.

- Relocate collections to another secure space or building in the park, nearby park, local museum, or regional repository or center with automatic fire protection systems during construction.
- Seal off work areas from collections in storage and on exhibit.

- Keep entrance and exit points clear and maintain a clean and uncluttered work environment.
- Ensure portable fire extinguishers of the proper type and size are available, visible, and unobstructed at the construction and adjacent areas.
- Do not impede or block fire detectors, sprinklers, or emergency strobes.
- Protect fire detectors from construction dust, debris, or impact.
- Dispose of cloths and paper products used for painting, polishing, or cleaning properly to avoid spontaneous ignition.
- *If* the PSFC has authorized the automatic fire detection and alarm system or the automatic fire sprinkler and/or suppression system to be turned off, *then* implement fire watch procedures and reactivate the system(s) immediately when work is completed.

See RM-58 Chapter 7.9: Fire Safety During Construction.

#### 16. Hot work procedures

Hot work includes welding, cutting, brazing, use of heat guns and blow torches, soldering, grinding, burning, or similar activities capable of initiating fires or explosions. A Hot Work Permit ([Form HW-1](#)) is required for all hot work in buildings housing collections. See RM-58.6.7.2.3.8: Hot Work for guidance on how to safely conduct hot work.

The curator should move objects to a safe location with automatic fire protection systems when hot work is being performed, including another structure in the park, another park, center, or local museum in accordance with NPS Museum Fire Protection Standard (9) (MHI 9.B.1.9). Include the precautions listed below in the SOW for hot work in buildings housing collections.

- Work must be contained within a designated or permit-required area with proper ventilation, automatic fire detection and suppression, and fully charged and visible fire extinguisher(s) and:
  - work areas within 35 feet must be cleared of combustibles
  - combustible waste is properly disposed
  - combustibles that cannot be cleared from the work area during the project are covered with fire-retardant tarps
  - flammable gas containers are sealed properly
  - fire watch must remain on site for 30 minutes after hot work has been terminated
- “Collections management plans and historical building plans

may designate areas or buildings where hot work is to be restricted” in accordance with RM-58.6.7.2.3.8.

**17. Fire-safe design for new or renovated structures housing collections**

Ensure that the design and construction of structures housing collections removes or reduces fire hazards and vulnerabilities. Design new structures or spaces housing collections or renovate existing spaces using the guidance provided below:

- Use inert noncombustible or fire-resistant material for all new construction, modifications, and renovations and:
  - **do not** use plasticized lumber and/or High Density Polyethylene (HDPE) building materials in new construction of structures housing collections
  - park facilities management staff should conduct visual inspection activities to identify HDPE in or adjacent to structures housing collections and take corrective actions
  - remove or relocate HDPE materials in accordance with [Memorandum: Flight 93 Memorial: High-Density Polyethylene Corrective Action Plan Recommendation Response](#)
- Provide adequate exits and exit signage in accordance with nationally recognized fire codes.
- Install:
  - automatic fire detection and alarm systems, including smoke detectors, and automatic fire sprinkler and/or suppression systems
  - a VESDA detection system in areas of high fuel load and concentrated collections
  - appropriate fire-rated assemblies to limit fire spread
  - doors, door hardware, and door frames with a fire rating consistent with their surrounding walls
  - emergency exit doors that are sufficiently wide and swing freely without restriction or blockage
- Equip doors to spaces protected with fire-rated walls with magnetic hold-opens or closers connected to the fire alarm system that will automatically close when the alarm is activated.
- Ensure there is an adequate water supply or access to water to fight a fire.

**18. Fire-safe design inside spaces housing collections**

Implement fire-safe design inside spaces housing collections using the guidance provided in this chapter and below:

- House collections in a dedicated storage space and separate:

- work and break rooms from collections areas
- spaces to accommodate flammable liquids, wet specimens, and freezers as appropriate
- supply storage areas
- Replace fluorescent light bulb ballasts with LED lighting, particularly those in lamps older than 15 years.
- Use fire-resistant:
  - interior and exterior finishes and surfaces, including wall coverings, insulation, and wood paneling such as flame-resistant medium-density fiberboard (MDF-FR) that will lower flame spread and smoke generation during a fire
  - furniture, equipment, and fixtures (such as UL listed appliances) with the lowest possible flame spread ratings
- Do not use carpeting, highly combustible materials, and materials that produce toxic fumes when burned in storage and research spaces.

Be aware the materials such as plastic will melt during a fire.

See the Smithsonian Institution's *Fire Protection & Life Safety Design Manual* for more detailed information on fire-resistant materials.

**19. Removing obstructions and keeping doors closed to prevent fire spread**

Well-fitting doors and windows that are kept closed when not in use can help prevent the spread of fire and smoke; all it takes to compromise them is a single open door or window.

- Keep fire exits and routes, aisles, and walkways clear and unobstructed to facilitate firefighting and evacuation.
- Keep fire-rated doors closed at all times.
- Do not alter, block, or wedge open doors and windows.
- Do not obstruct:
  - air flow around smoke detectors
  - fire suppression system discharge heads
  - fire protection components such as emergency strobes
  - visibility of exit signs
- Work with facilities management to keep brush, vegetation, and trash away from structures housing collections as appropriate.

**20. Compartmentation**

Compartmentation involves dividing a structure into separate compartments to limit the spread of fire. It is essential to fire protection and includes the installation of fire-rated walls, floors, ceilings, doors, hardware, windows, barriers, and other structural

design elements.

21. *Fire-rated interior barriers, walls, doors, and assemblies*

Work with the AHJ or RSFM, PSFC, regional curator, and facility manager to include fire-rated assemblies when renovating or designing new structures housing collections, including shared spaces such as workshops or other high fire-risk activities.

Fire-rated assemblies include the following:

- *Fire barriers* are continuous membranes designed to restrict the movement of fire.
- *Fire walls and doors* separate or subdivide structures and spaces and are designed to prevent the spread of fire.
- *Fire windows* have glass that resists shattering from heat, rapid temperature changes, and pressure of fire hoses.
- *Fire/smoke dampers* are devices installed in HVAC ducts, fire barriers, and fire doors to limit fire spread and smoke infiltration.
- *Smoke barriers* are installed in spaces between walls and floors to limit smoke infiltration.
- *Roofs* with an appropriate fire rating, such as Class A roofs and roof tiles.

Ensure fire-rated assemblies are regularly maintained and kept in good working order.

See RM-58 Chapter 6.3: Construction, Planning, and Design Review for additional information.

22. *Wildland fire protection*

Wildland fires can cause the catastrophic and total destruction of park collections and structures housing collections in a very short period of time. Timber and grass can fuel wildland fires. Periods of drought, high winds, lightning strikes, tree disease, careless use of matches, lighters, and camp fires, and years of low fire activity increase wildland fire risk. Wildland fires that do not threaten buildings can impact collections, staff, and visitors. The thick smoke caused by wildland fires can also damage collections and impair breathing, especially for individuals with respiratory problems.

Locate structures storing collections outside of susceptible areas of the Wildland-Urban Interface and implement appropriate fire protection and codes to protect collections stored in these structures, in collaboration with the park Fire Management Officer and cultural landscape specialist. If your park is in the wildland-urban interface, consult with the park Fire Management Officer to:

- Meet applicable federal and state wildland fire and building codes.

- Create and maintain firebreaks around structures housing collections.
- Use fire-resistive building and roofing materials such as fiber cement siding products to clad exterior walls for new construction as required by the International Wildland-Urban Interface Code.
- Determine wildland fire protection system needs, including the installation of deluge sprinkler systems on the roofs of structures housing collections in accordance with the International Wildland-Urban Interface Code (IWUIC).

See [DO 18: Wildland Fire Management](#) and [RM-18: Wildland Fire Management](#) for further guidance. See also the California Building Code [Chapter 7A: Materials and Construction Methods for Exterior Wildfire Exposure](#).

**23. Wildland fire design considerations for structures housing collections**

Ensure that the location, design, and construction of structures housing collections removes or reduces the threat of wildland fires to the extent possible. The International Wildland-Urban Interface Code (IWUIC) includes construction guidelines that provide additional protection based on the fire hazard severity of building sites.

Work with the park Fire Management Officer, facility manager, AHJ or RSFM, and the regional curator to include ignition-resistant construction materials and features in purpose-built and adapted structures housing collections, including (in alphabetical order):

- Eaves and soffits.
- Exterior walls, doors, and windows.
- Gutters and downspouts.
- Roof coverings.
- Underfloor areas.
- Ventilation openings and accessory structures.

Consult with the Fire Management Officer, historical architect advisor, and cultural landscape specialist to determine wildland fire protection strategies for historic structures.

See IWUIC [Chapter 5: Special Building Construction Regulations](#) for further information.

**F. Fire Protection Systems and Equipment**

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Automatic sprinkler systems are one of the most effective fire safety tools. According to [NPS Fire Prevention 52](#), "...[Y]our chance of dying in a fire is reduced by 80% in a building with a sprinkler system and property damage can be reduced as much as



71%.” Structures *without* an automatic fire detection and alarm system and an automatic fire sprinkler and/or suppression system are at risk of catastrophic fire. Objects and structures housing collections exposed to fire may be irreparably damaged or lost forever.

***A fire protection system is effective only if detection is immediately followed by automatic suppression.***

Work closely with the PSFC, AHJ or RSFM, facility manager, and regional curator to design, select, and install code-compliant automatic fire protection systems. These systems should provide appropriate protection 24/7 for life safety, the collection, and structures housing collections. Work with the PSFC to train museum staff annually in the use of portable fire extinguishers.

1. *Essential fire protection systems and equipment*

Essential fire protection systems and equipment include:

- *Automatic fire detection and alarm systems.* These operate 24/7 and should be combined with automatic fire sprinkler and/or suppression systems.
- and**
- *Automatic fire sprinkler and/or suppression systems* include water-based sprinkler systems and/or gaseous or “clean agent” suppression systems. Both systems control and extinguish fires 24/7 without human intervention. They should be combined with automatic fire detection and alarm systems.
- and**
- *Portable fire extinguishers* (PFEs) are used to manually extinguish fires. They require human intervention. They *are not* a substitute for automatic fire sprinklers and/or suppression systems.

***Keep automatic fire detection and alarm systems and automatic fire sprinkler and/or suppression systems operational at all times.***

See RM-58.6.4.2: Fire Protection System Design, and RM-58.7, Appendix A: Fire Protection Systems for a fire protection system comparison.

2. *Designing a museum automatic fire protection system*

A fire protection engineer should design the automatic museum fire protection system in collaboration with the curator and interdisciplinary team. The curator and regional curator should review all system plans and designs and confirm that they are appropriate for structures housing collections. The AHJ or RSFM must approve the design and location of the automatic fire detection and alarm system and the automatic fire sprinkler and/or suppression system, including control valves, tanks, and pipe runs.

For furnished historic structures, design and install automatic fire protection systems with minimum impact to historic fabric and character in consultation with the historical architect advisor and

interdisciplinary team.

When designing a museum fire protection system:

- Design the automatic fire protection systems as per RM-58.6.4.3: Fire Protection Systems Installation for ease of installation, testing, and maintenance and identifying the source of alarms and system problems.
- Ensure that fire alarm communications accurately signal the presence and location of a fire to a UL listed and/or regionally-approved receiving and monitoring station or central station that is monitored 24/7.
- Ensure emergency strobes are visible throughout the structure and register at the designated fire response center.
- Ensure backup power is available.
- Ensure availability of water and necessary water pressure.

### 3. *Selecting automatic fire protection equipment*

Select automatic fire protection systems best suited to the needs of the collection and structure in accordance with RM-58.7, Appendix A, Figure 9.3: Object Assessment, and the considerations noted below. Make this selection in consultation with a fire specialist experienced with museum fire protection systems, the regional curator, and the interdisciplinary team.

Take the following considerations into account when selecting fire protection equipment:

- Object composition (paper, paintings, wet specimens, cellulose nitrate-based materials, etc.).
- Potential impact of suppression agent on the collection.
- Collections housing (closed steel cabinets, mobile compact storage systems, open shelving, on exhibit in closed cases, or on open display).
- Function of the museum space (exhibit, storage, or processing).
- Characteristics of the structure, including:
  - purpose built, adapted, or historic structure
  - level of compartmentation
  - fabric of the structure
  - proximity to and adequacy of water supply
- Number of occupants in the structure.

- Whether the structure is shared with workshops or other programs that pose a high fire risk.
- Capacity of utilities and other physical resources to support automatic fire protection systems.
- Frequency and regularity of inspection, testing, and maintenance.
- Local climate (below vs. above freezing temperatures).
- Fire department response time and capabilities.

#### 4. *Automatic fire detection and alarm systems*

Automatic fire detection and alarm systems automatically alert occupants inside a structure and designated fire response personnel such as the local fire department or park emergency response personnel of a fire 24/7.

An automatic fire detection and alarm system can include the following (in alphabetical order):

- Alarm notification appliance (horns, bells, strobes, etc.).
- Control unit.
- Detectors (smoke, heat, flame, etc.) appropriate to collection material(s) and location.
- Fire alarm pull boxes (manual pull stations).
- Initiating device (manual or automatic smoke detectors, heat detectors, pull devices, water flow switches, etc.).
- Power supply with battery back-up.

The automatic fire detection and alarm system should monitor the status of all detectors and alarm pull stations and provide notification when components are damaged or require maintenance. Ensure that the system monitors and reports communication failures 24/7 and is compatible with existing monitoring equipment.

Be aware that automatic fire detection and alarm systems *only* provide information. They *do not* suppress fire. These systems *must* be interconnected with the automatic fire sprinkler and/or suppression system to ensure prompt fire suppression and control.

***Systems that are not monitored or that do not notify responders, such as local alarm systems, can result in catastrophic loss or significant delay in suppressing a fire.***

See RM-58.7, Appendix A: Automatic Fire Detection Systems for a comparison of various automatic fire detection systems.

## 5. *Fire detector types*

Fire detectors are used to quickly detect the smoke, heat, or radiant energy produced by the flames of a fire and alert occupants and response personnel.

Types of fire detectors used in NPS structures housing collections described in RM-58.7, Appendix A: Detectors include but are not limited to (in alphabetical order):

- Flame or radiant energy detectors.
- Heat detectors (line or spot type).
- Incipient sampling detectors (Air Aspiration, Air Sampling, or VESDA).
- Ionization smoke detectors.
- Laser detectors.
- Photoelectric smoke detectors.
- Projected beam detectors.

Each detector type has advantages and disadvantages as described in the Glossary, RM-58.7, Appendix A: Structural Fire Protection of Cultural Resources in the National Park Service (NPS), and NFPA 914 Appendix D, Table D.2(c): Classification of Fire Detection and Alarm Systems by Type of Control. Consult with the PSFC, AHJ or RSFM, and a structural fire protection professional to select the appropriate type(s) and number of fire detectors needed to provide adequate coverage for the collection.

The types of fire detectors listed above may be installed either in conventional or addressable systems:

- *Conventional detectors* alert occupants and responders that a fire has occurred somewhere in the system, but do not provide a specific location. They are best suited for systems covering a small area.
- *Addressable detectors* alert and provide occupants and responders with the specific room or location of the detector(s) where fire was indicated. They provide a higher level of flexibility in system operation than conventional detectors. Addressable detectors may be combined with intrusion detection security systems.

## 6. *Fire alarms and alarm system monitoring*

Fire alarms provide visual and auditory notification of a fire. They may be automatic or manual.

*Automatic* alarms and alarm communications need to accurately signal the presence and location of a fire to a UL listed and/or regionally-approved receiving and monitoring station or central station that is monitored 24/7. These include the park dispatch

office, another park’s dispatch office, local fire department, a contractor, or a Federal Protective Service MegaCenter. Ensure that all monitoring software is approved for NPS use.

*Manual* fire alarm pull boxes may be part of the fire alarm system. Once activated, the pull box alerts occupants and notifies the alarm receiving station.

See RM-58.6.4.2: Fire Protection Systems Design and 6.4.3: Fire Protection Systems Installation, as well as Question D.5: What special considerations should be addressed with the local fire department?

7. *Automatic fire sprinkler systems and fire suppression systems used in structures housing collections*

Automatic suppression is the process of extinguishing a fire through the use of automatic fire sprinkler systems and/or fire suppression systems.

*Sprinkler systems* use liquid water to extinguish and control fire.

*Suppression systems* use substances other than liquid water such as gas to extinguish and control fire.

Sprinkler systems widely used in NPS museums include:

- Wet pipe systems.
- Dry pipe systems.
- Pre-action systems.

Suppression systems used in NPS museums include:

- Clean agent (gaseous) systems (may require separate evacuation procedures).
- High-pressure water mist systems.

When there is a fire in a sprinklered structure, only the sprinkler head(s) exposed to heat (usually between 165°–225°F) should open and discharge water individually to suppress or control the fire. In certain circumstances, a fire suppression system may be installed alongside a fire sprinkler system.

See [Figure 9.7: Comparison of Selected Fire Suppression Systems for Museum Objects](#) and [RM-58.7, Appendix A, Fire Protection System Comparisons](#) for advantages and disadvantages of each suppression system type.

8. *Suppression systems not recommended for use in spaces housing collections*

Antifreeze, deluge, and high expansion foam suppression systems are not recommended for use in spaces housing NPS museum collections due to difficulty of maintenance, life safety risk, damaging effect on collections, and/or high cost. See [RM-58.7, Appendix A, Fire Protection System Comparisons](#) for further information.

NPS no longer installs Halon systems, as they contribute to environmental (ozone) degradation. Consult with the AHJ or RSFM about occupant-use standpipe hoses.

9. *Automatic fire sprinkler system installation*

Sprinklers are usually connected to the domestic water supply through an underground connection on the exterior of the building. In instances where a municipal water supply does not exist or is inadequate, a tank or cistern may be provided with a pump to supply the sprinkler system as approved by the AHJ or RSFM.

Install sprinkler heads as approved by a fire protection engineer or NICET III equivalent to protect the collections and structure:

- Design sprinkler piping to run through aisle areas, not over the top of cabinets where possible, and:
  - protect sprinkler heads with wire cages as appropriate
  - mark and label exposed sprinkler piping
- Work closely with the AHJ or RSFM and a design professional when installing fire sprinklers and selecting non-corrosive piping materials, fittings for piping connections, sealants, and other components.
- Ensure that sprinkler systems are designed to allow facilities management and first responders to have access to control valves at all times in one area of a building without having to shut off the entire system.
- ***Do not*** install wet pipe systems in areas or spaces subject to freezing.

10. *Commissioning automatic fire protection systems*

Commissioning tests whether a fire protection system is correctly installed and meets NPS and NFPA requirements, manufacturers' specifications, and functions as described in the contracting documents.

Generally, the commissioning period lasts a year after the installation of a new system. Ensure that a one year commissioning period is incorporated into the contract for automatic fire protection system installation. Complete commissioning according to the schedule outlined in the contract and in accordance with RM-58.6.4.5: Commissioning of Installed Fire Protection Systems.

***Fire protection systems must be commissioned prior to acceptance by the Contracting Officer's Representative.***

Note: Commissioning is required in addition to the warranty period when the system should not be worked on by anyone except the original installers so as not to void the warranty.

See RM-58.6.4.4: Commissioning of Installed Fire Protection Systems.

**11. Inspection, testing, and maintenance for automatic fire protection systems**

Regular inspection, testing, and maintenance are essential to the proper functioning of automatic fire protection systems. Inappropriate modifications and/or lack of maintenance can result in system failure.

Work with the PSFC and facility manager to ensure inspection, testing, and maintenance of automatic fire protection systems is conducted:

- By the manufacturers' representative and/or NICET II equivalent structural fire protection professional.
- At minimum annually in accordance with:
  - RM-58.6.4.5: Fire Protection Systems Inspection Testing and Maintenance
  - NPS inspection, testing, and maintenance [Schedules](#)
  - nationally recognized fire codes
  - manufacturer's specifications

On occasion, fire protection systems may be faulty and subject to a manufacturer recall. Check the U.S. Consumer Product Safety Commission [website](#) to determine if installed systems have any pending recalls.

See also RM-58. 6.4.5.1: ITM Qualified Personnel.

**12. Avoiding unintentional alarms, accidental sprinkler discharge, and system failure**

Unintentional activation of fire alarms and sprinkler discharge can occur due to improper design, improper or lack of maintenance, and/or human error.

Move or cover affected objects as soon as the discharge is observed to prevent further damage. Immediately contact facilities management *and* the fire department to identify the source of the unintentional activation to halt the discharge.

**Do not** shut down a suppression or sprinkler system that has activated until the fire department has arrived and determined there to be no fire, or the cause of the activation is obvious and not due to fire.

To avoid unintentional sprinkler discharge and system activation:

- Ensure automatic fire protection systems are installed, commissioned by the AHJ or designee, and used in accordance with nationally recognized fire codes and the manufacturers' specifications.
- Keep detectors clean and free of dust, as dirty smoke detectors

and spider webs are the most frequent cause of unwanted alarms.

- Maintain a regular, ongoing inspection, testing, and maintenance schedule to prevent alarm, sprinkler, and other system component failure and ensure alarms operate 24/7 and are audible.
- Provide backup power sources to ensure the control panel does not fail or operate erratically, particularly in areas prone to unreliable electric power.
- Replace backup batteries every five years at minimum in accordance with nationally recognized fire codes.
- Consult with the system manufacturer if special equipment finishes are needed.
- ***Do not:***
  - modify automatic fire protection systems outside manufacturers' specifications
  - paint over or use fire protection system components for any function other than their intended use
  - hang equipment, decorations, or clothes hangers from fire protection system components such as sprinkler heads and pipes
  - create steam, dust, or other types of concentrated fog that can be interpreted as smoke by fire detectors

See Question H.5: Water damage from fire sprinklers.

### 13. *Portable fire extinguisher types*

Manually operated portable fire extinguishers (PFEs or “fire extinguishers”) are often the first line of defense when a fire breaks out in a building. PFEs *supplement* automatic fire protection. Annual training to operate a PFE is required for all staff. When installed in a building, properly maintained, and in the hands of trained staff, PFEs may stop a fire before it gets out of control. Fire extinguishers must comply with NFPA 10: *Standard for Portable Fire Extinguishers*.

There are many different types of fire extinguishers available, including (in alphabetical order):

- *ABC multipurpose dry chemical extinguishers* use a fine chemical powder.
- *Carbon Dioxide (CO<sub>2</sub>) extinguishers* used pressurized CO<sub>2</sub> gas.
- *Clean agent extinguishers* use a pressurized gas or liquid.



- *Water extinguishers* use a stream of water.
- *Water mist extinguishers* use a spray of water of smaller particle size than a water extinguisher.

Note: Purple K and Monnex™ dry chemical extinguishers can cause severe damage to objects, and *should not* be used in structures housing collections.

14. *Portable fire extinguisher selection for structures housing collections*

Each type of PFE has advantages and disadvantages as described in [Figure 9.8: Comparison of Selected Portable Fire Extinguishers for Museum Objects](#). A combination of different PFE types may be necessary. Consult with the PSFC, AHJ or RSFM, regional curator, and a conservator to determine the type(s) of PFE best suited to each structure housing collections.

Consider the following variables when selecting fire extinguishers:

- *Type of materials in the collection:* Some materials, such as metals and composites, may be more susceptible to damage from certain fire extinguishers than others.
- *Containerization of objects:* Objects in sealed steel cabinets or mobile carriages in storage and on exhibit in cases or vitrines are more protected than those in open storage or display.
- *Impact of extinguishing agent on objects:* The chemical composition of non-water PFEs may damage objects, as can the high pressure of non-mist water PFEs.

Installation and placement of fire extinguishers depends on various factors, including type of occupancy, hazards present in the building, square footage, and building layout. Ensure extinguishers are properly spaced in a building and installed along regular routes and exits so employees can access them when needed.

Note: Many museums use water mist extinguishers in collections areas, unless there are specific hazards such as flammable liquids that require other types of extinguishers.

15. *Portable fire extinguisher inspection, testing, and maintenance*

Portable fire extinguishers should be inspected monthly by building occupants for signs of damage such as denting or detached parts and confirmation that the pressure gauge is in the green. Improper maintenance can compromise efficacy during a fire. They must be annually inspected and maintained by an organization or individual acceptable to the AHJ or RSFM in accordance with the manufacturers' instructions, RM-58.6.9.3: Inspection Testing and Maintenance of Portable Fire Extinguishers, and NFPA 10.

## G. Museum Fire Section of the Park Structural Fire Management Plan

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1. *What is the park Structural Fire Management Plan (SFMP)?*

The park Structural Fire Management Plan (SFMP) addresses fire protection guidance on life safety and protection of park resources, including museum collections.

2. *What is the Museum Fire Section of the SFMP?*

The Museum Fire Section of the SFMP addresses the needs of collections and structures housing collections. It must be appended to the park SFMP. It covers museum fire protection, fire-safe practices, automatic fire protection systems, portable fire extinguishers, fire control and Emergency Response Steps, floor plans, and evacuation routes. See [Figure 9.4: Sample Museum Fire Section of Park Structural Fire Management Plan](#), which can be customized as needed. Salvage procedures, emergency contacts, and an emergency supply list can be found in Figures 10.21 – 10.24.

The curator is responsible for developing and updating the Museum Fire Section in collaboration with the PSFC and/or AHJ or RSFM and the facility manager, and ensuring that it is appended to the park SFMP in accordance with NPS Museum Fire Protection Standard (2) (MHI 9.B.1.2). The regional curator reviews and concurs with the Museum Fire Section of the park SFMP. A copy must be provided to the regional curator on approval by the superintendent. The Museum Fire Section should be reviewed and updated on the same schedule as the park SFMP.

3. *How do I restrict sensitive information in the Museum Fire Section?*

To ensure collections security, restrict the distribution of floor plans indicating object locations to the curator, superintendent, and regional curator. **Do not** include these sensitive floor plans in copies of the Museum Fire Section distributed to the AHJ or RSFM or local fire department. Ensure that all copies of the Museum Fire Section containing floor plans of “first priority” object locations are filed in a locked cabinet.

4. *When does the Museum Fire Section need to be reviewed and updated?*

The Museum Fire Section is reviewed annually and updated every five years on the same schedule as the park SFMP and/or after a significant structural fire incident, addition of a new or renovated structure to house collections, new exhibit installation, or change in the curator. When a new superintendent and/or PSFC is appointed, ensure they have a copy of the current version of the Museum Fire Section.

## H. Fire Emergency Response and Salvage

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If a fire breaks out in an area where collections are housed, in addition to the possibility of catastrophic loss, the resulting damage may include soot, smoke, and/or water and physical damage from fire sprinkler or suppression systems, hoses, and fire extinguisher discharge.

1. *Implementing fire Emergency Response Steps*

Implement Fire Emergency Response Steps ([Figure 9.9](#)) as soon as a fire is discovered.

**Do not** shut off the fire alarms or the sprinkler and/or suppression system. If this is to be done, it should **only** be done by emergency responders.

The fire department and/or Incident Commander will take over operational control of the site until the area is declared safe to re-enter. After the fire scene is cleared, a structural fire protection professional should ensure that the automatic fire protection systems are fully functional. Work with facilities management staff and fire professionals to review system procedures annually or after a fire incident.

See Chapter 10.A.8: What is the Incident Command System (ICS)?

2. *Planning for rapid entry to structures housing collections during a fire*

In the event of a fire, first responders will need access to secured structures and spaces housing collections. Consult with the local fire department or first responders to establish a means for rapid entry to structures housing collections during a fire emergency, such as an emergency access key box.

Many fire departments use emergency access key box systems (such as Knox-Box<sup>®</sup> or SupraSafe<sup>™</sup>) that use a master key for all key boxes in their jurisdiction. The curator **must** ensure that the local fire department's key control procedures are sufficient to maintain museum security and prevent theft or accidental loss. The emergency access key box should have electronic tamper switches that are connected to the intrusion detection system and monitored 24/7 by closed-circuit television. The park museum intrusion detection system should detect and notify the curator of unauthorized attempts to enter spaces housing collections.

The rapid entry system is implemented **in addition to** museum security procedures. The curator **must** maintain key control with a log of all keys and key cards issued to museum staff for structures and spaces housing collections, including storage cabinets and exhibit cases. Museum keys are restricted to designated museum staff responsible for the collection. Keys **must** be signed in and out in the key log **only** by those authorized in writing to use them.

See [Chapter 14](#): Museum Security.

3. *Posting information for fire emergency response*

For ease of access before, during, and after a fire, post copies of fire Emergency Response Steps, the emergency contact list, and evacuation routes and floor plans in accessible locations in storage, exhibit areas such as the visitor center front desk, and work areas.

4. *Salvage procedures after a fire*

After the fire scene has been cleared for entry, quickly and safely remove collections from affected areas. Implement appropriate

salvage procedures immediately after a fire to help stabilize damaged or affected objects. **Do not** perform any interventive treatments on objects damaged by fire; this should be done by a conservator. Contact the MCEOP team leader, regional curator, and/or contractors for assistance.

For detailed salvage procedures, see Figure 10.24: Salvage Procedures.

See Chapter 10.G: Relocating Museum Collections and [COG 2/13: An Introduction to Respirator Use in Collections Management](#).

#### 5. *Water damage from fire sprinklers*

Sprinklers and/or fire hoses extinguish the fire, but may cause significant damage to collections. The water pressure and velocity of fire hoses, typically 120 – 150 gallons per minute, and exposed sprinkler heads that may discharge water until manually turned off can damage objects and result in water saturation.

To minimize water damage from fire sprinklers:

- Implement:
  - regular inspection, testing, and maintenance of the automatic fire sprinkler system by qualified personnel
  - frequent visual inspection by trained park staff
- House objects in closed cabinets and:
  - raise cabinets 4 – 6 inches off the floor
  - house oversized objects off the floor
- Follow the steps in Figure 10.24: Salvage Procedures for water-damaged collections to prevent mold growth and air dry or freeze objects.

See NPS Fire Protection Systems Installation and ITM [Guidance](#).

#### 6. *Soot and smoke damage*

Soot and smoke are byproducts of fire that can cause significant damage. Smoke can penetrate walls and objects and leaves a distinct, residual odor. It can spread to other parts of the structure through air ducts, open doors, or small wall and ceiling penetrations and settling on objects.

Duct fire/smoke dampers can limit the spread of smoke, and smoke barriers can provide additional protection. Once the fire is out and the structure is stabilized for access, work with an abatement team to confirm that the space is free of contaminants so that salvage can proceed. Work with a conservator to treat soot and smoke-damaged objects as quickly as possible to prevent permanent adhesion or damage.

## I. Training, Drills, and Documentation

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### 1. Training for portable fire extinguishers

All staff, including able-bodied employees, volunteers, and partners, must receive PFE training at least once annually in accordance with RM-58.6.9.1: PFE Training. The park safety officer, in cooperation with the PSFC, conducts training and reviews fire prevention measures.

See the NPS Fire Extinguisher Training [website](#).

### 2. Fire drills

Fire drills reduce the possibility of panic in a real situation. They should be held periodically to ensure that all personnel, including museum staff, know how to calmly react in an emergency. Follow instructions in the park SFMP when a fire drill occurs.

### 3. Documentation

Document all museum fire protection activities and maintain copies for museum management and reference purposes. Include:

- *Planning and mitigation*
  - risk assessment documents
  - Museum Mitigation Action Plan (Figure 10.3)
  - Museum Fire Section of the SFMP
  - museum fire protection system installation documents
- *Documenting the decision not to install automatic fire protection systems or consolidate objects* (as per NPS Museum Fire Protection Standard (1) [MHI 9.B.1.1]): In collaboration with the AHJ or RSFM, complete and submit:
  - Object Assessment (Figure 9.3)
  - Record of the Superintendent's Decision Regarding Installation of Automatic Fire Protection Systems and Consolidation of Collections (Figure 9.3a)
  - provide copies to the regional director, regional curator, and historical architect advisor as appropriate
- *Hazardous materials:*
  - inventory of hazardous objects, non-collection materials, and cleaning chemicals
  - binder of SDS for these materials
- *Relocation:* Tracking and object relocation information.
- *Salvage:* Written reports and logs describing the type(s) of object damage sustained, salvage activities (freezing, drying, etc.) and who authorized them, and other related information.
- *Photographs:* Images of affected objects and spaces.

- *Distribution:* File these documents in the curatorial office together with the MCEOP. File sensitive documents in a locking filing cabinet and limit distribution. Distribute copies to the AHJ or RSFM, regional director, regional curator, the park central and museum files, and the historical architect advisor if appropriate.

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  - NFPA 25: *Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems*
  - NFPA 30: *Flammable and Combustible Liquids Code*
  - NFPA 40: *Standard for the Storage and Handling of Cellulose Nitrate Film*
  - NFPA 45: *Standard on Fire Protection for Laboratories Using Chemicals*
  - NFPA 55: *Compressed Gases and Cryogenic Fluids Code*
  - NFPA 70: *National Electric Code*
  - NFPA 72: *National Fire Alarm and Signaling Code*
  - NFPA 92: *Standard for Smoke Control Systems*
  - NFPA 101: *Life Safety Code*
  - NFPA 105: *Standard for Smoke Door Assemblies and Other Opening Protectives*
  - NFPA 232: *Standard for the Protection of Records*
  - NFPA 257: *Standard on Fire Test for Windows and Glass Block Assemblies*
  - NFPA 701: *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*
  - NFPA 750: *Standard on Water Mist Fire Protection Systems*
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## Object Assessment

Use the information generated from this assessment to support the decision to install automatic fire protection systems *or* relocate individual "first priority" objects to a safe space where these systems are installed.

Complete this assessment in collaboration with the Collections Advisory Committee and interdisciplinary team for museum fire protection. Use this assessment together with the RM-58 Chapter 7, Appendix A: Structural Fire Management Museum Collections Assessment Matrix.

**Complete this assessment for each space or structure storing or exhibiting collections.**

Park/Unit Name: \_\_\_\_\_

Indicate if the space or structure is: (Check all that apply)

- |                                  |   |   |  |
|----------------------------------|---|---|--|
| <input type="checkbox"/> Storage | <input type="checkbox"/> Work Room                    | <input type="checkbox"/> Preparation Area | <input type="checkbox"/> Research Room |
| <input type="checkbox"/> Exhibit | <input type="checkbox"/> Furnished Historic Structure | <input type="checkbox"/> Visitor Center   |  |

Space/Structure Name: \_\_\_\_\_ FMSS Number: \_\_\_\_\_

Number of Floors: \_\_\_\_\_ Floor Area (Sq. Ft.): \_\_\_\_\_

Completed By: \_\_\_\_\_ Date: \_\_\_\_\_  
(Print Name, Title)

**A. Evaluation of Objects in this Space**

One or more "Yes" responses to the questions in this section indicates the need to install an automatic fire protection system *or* relocate "first priority" objects to a safe space where these systems are installed.

**1. Are there objects, specimens, and/or archival items in this space/structure that are/have:** (indicate all that apply)

Associated with an eminent individual(s) or event?	YES <input type="checkbox"/>	NO <input type="checkbox"/>	Essential for resource management?	YES <input type="checkbox"/>	NO <input type="checkbox"/>	High interpretive and/or educational value?	YES <input type="checkbox"/>	NO <input type="checkbox"/>
High monetary value?	YES <input type="checkbox"/>	NO <input type="checkbox"/>	High research and scientific value?	YES <input type="checkbox"/>	NO <input type="checkbox"/>	Irreplaceable?	YES <input type="checkbox"/>	NO <input type="checkbox"/>
Mission-critical?	YES <input type="checkbox"/>	NO <input type="checkbox"/>	Rare?	YES <input type="checkbox"/>	NO <input type="checkbox"/>	Type specimens?	YES <input type="checkbox"/>	NO <input type="checkbox"/>
						Voucher specimens?	YES <input type="checkbox"/>	NO <input type="checkbox"/>

Comment: \_\_\_\_\_

**2. How many museum objects are stored or exhibited in the space/structure?**

Total number of objects in this space:	Number of objects meeting criteria in A.1:
Comment:	Comment:

**3. Would the loss of the object(s) housed in this space/structure negatively impact the park research, exhibition and visitor interpretation, and/or education program?**

YES  NO   
Comment: \_\_\_\_\_

**4. Are the accession (and deaccession) book and folders housed in this space/structure?**

YES  NO   
Comment: \_\_\_\_\_

**5. Are any of the objects in this space/structure on loan to the park or center?**

YES  NO  Number: \_\_\_\_\_  
If "Yes," is fire protection a requirement of the loan(s)? YES  NO   
Comment: \_\_\_\_\_

**Figure 9.3 Object Assessment**



**B. Evaluation of Fuel Load in the Space/Structure Housing Collections**

A preponderance of "Yes" responses to questions in this section indicates the need to install automatic fire protection systems *or* relocate "first priority" objects to a safe space where these systems are installed.

**1. Do objects in this space/structure add to the structure's fuel load?** (Indicate numbers\* for all that apply)

Archival items	YES <input type="checkbox"/>	NO <input type="checkbox"/>	Linear Feet:	Comment:
Basketry	YES <input type="checkbox"/>	NO <input type="checkbox"/>	Number:	Comment:
Cellulose nitrate-based materials	YES <input type="checkbox"/>	NO <input type="checkbox"/>	Number:	Comment:
Firearms and ordnance	YES <input type="checkbox"/>	NO <input type="checkbox"/>	Number:	Comment:
Magnetic media	YES <input type="checkbox"/>	NO <input type="checkbox"/>	Number:	Comment:
Negatives, polyester	YES <input type="checkbox"/>	NO <input type="checkbox"/>	Number:	Comment:
Paintings	YES <input type="checkbox"/>	NO <input type="checkbox"/>	Number:	Comment:
Photographic prints	YES <input type="checkbox"/>	NO <input type="checkbox"/>	Number:	Comment:
Textiles	YES <input type="checkbox"/>	NO <input type="checkbox"/>	Number:	Comment:
Wet specimens	YES <input type="checkbox"/>	NO <input type="checkbox"/>	Number:	Comment:
Wood	YES <input type="checkbox"/>	NO <input type="checkbox"/>	Number:	Comment:
Works on paper	YES <input type="checkbox"/>	NO <input type="checkbox"/>	Number:	Comment:
Other (describe)				
Total number*:				

**2. What percentage\* of objects, specimens, and/or archival items in this space/structure are housed in:** (Indicate all that apply)

Storage	Closed steel cabinets	%:	Open shelving	%:
	Mobile compact storage (manual)	%:	Mobile compact storage (electronic)	%:
Exhibit	Exhibit cases	%:	Open display	%:
Other:				
Comment:				

**3. Are flammable or combustible non-collection materials housed in this space/structure?**

YES  NO

Describe:

**4. Does this space/structure include a workshop, preparation room, laboratory, breakroom with cooking appliances, or other activities such as living history activities?**

YES  NO

Describe:

\* Use ( ) to indicate estimate.

**Figure 9.3 Object Assessment (continued)**

## Record of the Superintendent's Decision Regarding Installation of Automatic Fire Protection Systems and Consolidation of Collections

The Superintendent completes this Record in accordance with NPS Museum Fire Protection Standard (1.c) (MHI 9.B.1.1.c) together with the Object Assessment (Figure 9.3), and provides a copy of these two documents to the AHJ or RSFM, Regional Director, and Regional Curator.

Park/Unit Name: \_\_\_\_\_

Superintendent: \_\_\_\_\_  
 (Print Name) (Signature)

Submitted by: \_\_\_\_\_ Date: \_\_\_\_\_  
 (Print Name, Title)

Building/Structure Name	FMSS Number
Number of Floors	Floor Area (Sq. Ft.)

Indicate if the building or structure is (Check all that apply):			
<input type="checkbox"/> Storage	<input type="checkbox"/> Work Room	<input type="checkbox"/> Preparation Area	<input type="checkbox"/> Research Room
<input type="checkbox"/> Exhibit Gallery	<input type="checkbox"/> Furnished Historic Structure	<input type="checkbox"/> Visitor Center	
<input type="checkbox"/> Other (describe):			

Type of construction (concrete, wood, steel, masonry, etc.) for the following:	
Walls	
Floors	
Ceilings	
Roof	
Supporting Members	

Existing automatic fire protection systems (Check all that apply):			
<input type="checkbox"/> Sprinkler system	<input type="checkbox"/> Suppression system	<input type="checkbox"/> Fire detection / alarm system	<input type="checkbox"/> Smoke detection/ alarm system
<input type="checkbox"/> None			
<input type="checkbox"/> Other (describe):			
Comment:			

Availability of utility resources (Check all that apply):	
<input type="checkbox"/> Water (city/well)	<input type="checkbox"/> Electricity (commercial/generator)
<input type="checkbox"/> Other (describe):	
Comment:	

Describe the rationale for *not* installing an automatic fire protection system in this building/structure, *or for not* consolidating individual "first priority" objects to a safe space where these systems are installed, in accordance with NPS Museum Fire Protection Standard (1):

**Figure 9.3a Record of the Superintendent's Decision Regarding Installation of Automatic Fire Protection Systems and Consolidation of Collections**

**[Beautiful Home National Historic Site (BEHO)]**

**Sample Museum Fire Section of Park Structural Fire Management Plan (SFMP)**

Prepared by Curator	_____	_____	_____
	Name (Print)	Signature	Date
Concurred by Chief, Cultural Resources	_____	_____	_____
	Name (Print)	Signature	Date
Concurred by Park Structural Fire Coordinator	_____	_____	_____
	Name (Print)	Signature	Date
Concurred by Regional Structural Fire Manager	_____	_____	_____
	Name (Print)	Signature	Date
Concurred by Regional Curator	_____	_____	_____
	Name (Print)	Signature	Date
Approved by Superintendent	_____	_____	_____
	Name (Print)	Signature	Date

**Review and Update Record**

Annual Review Date	_____	_____	_____
	Name (Print)	Signature	Date
Update (every 5 years)	_____	_____	_____
	Name (Print)	Signature	Date

**Past Reviews**

<b>Date</b>	<b>Reviewed by, Title</b>	<b>Signature</b>
3/20/2018	Marianne Kuratur, curator	<i>Marianne Kuratur</i>
4/12/2019	Marianne Kuratur, curator	<i>Marianne Kuratur</i>
2/24/2020	Marianne Kuratur, curator	<i>Marianne Kuratur</i>

**Figure 9.4 Sample Museum Fire Section of a Park Structural Fire Management Plan**

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**Figure 9.4 Sample Museum Fire Section of a Park Structural Fire Management Plan (continued)**

## I. Overview

This Museum Fire Section provides guidance on the preservation and protection of collections and structures and spaces housing collections as part of the [*Beautiful Home National Historic Site (BEHO)*] Structural Fire Management Plan (SFMP). It covers museum fire protection, risk assessment, pending corrective actions, fire-safe practices, and automatic museum fire protection systems designed to remove or reduce fire hazards and vulnerabilities for [*BEHO*] collections and structures housing collections. It includes fire Emergency Response Steps (Figure 9.9) and salvage procedures. The park SFMP provides life safety guidance.

The [*BEHO*] collection numbers [*over 16,000 objects.*] It includes [*artwork, archeology, history, period decorative arts and furniture, historic photographs, and archival items.*] The collections and museum records are housed in the park [*Curatorial Facility*], with [*550 objects*] on exhibit in [*Hilltop House*].

[*Hilltop House*] (FMSS ID# [*77777*]), built in [*1898*], is a [*two*] story structure with a [*stone*] foundation and a [*slate shingle*] roof. [*A steel frame supports the brick walls.*] There are [*two*] exterior doors on the [*ground floor*], and each of the [*two*] floors has [*four single pane sash*] windows. The floors are [*original hard wood, and are not carpeted.*] [*Hilltop House is on the National Register of Historic Places (#9999999).*] It is located [*two miles from the town center.*]

The [*Curatorial Facility*] (FMSS ID# [*77776*]), located [*a quarter mile to the north of Hilltop House*], is a [*one*]-story, [*purpose-built concrete block structure*] built in [*1993*]. The structure has [*two*] exterior doors: [*one entrance on the west side for staff and visitors, and the emergency exit on the south side.*] It includes [*two workspaces and a research room.*]

The Superintendent's office and park administration offices are located [*in the town center and house a backup of ICMS and digital images of the collection.*] Security includes [*emergency access key boxes mounted in front of Hilltop House*] and the [*Curatorial Facility*]. The key log is located in [*the curatorial office*].

## II. Museum Fire Protection Standards and Related Policies

### NPS Museum Fire Protection Standards (*Museum Handbook Part I Chapter 9.B.1*)

1. (a) Install automatic fire detection and alarm systems **and** automatic fire sprinkler and/or suppression systems in all purpose-built and adapted structures and spaces housing or exhibiting museum collections as approved by the AHJ or RSFM in consultation with the park or regional museum curator and interdisciplinary team. In furnished historic structures, select and install automatic fire detection and alarm systems and automatic fire sprinkler and/or suppression systems as approved by the AHJ or RSFM in consultation with park and regional facilities management staff, the historical architect advisor, and the park or regional museum curator.

**or**

- (b) Consolidate collections in structures protected with automatic fire detection and alarm systems and automatic fire sprinkler and/or suppression systems.

**or**

- (c) The decision not to use these systems must be made by the superintendent or delegate in consultation with the AHJ or RSFM, park curator, regional curator, and historical architect advisor as appropriate, using information from Figure 9.3: Object Assessment, and the Museum Collections Assessment Matrix and Historic Property Assessment Matrix in RM-58.7.A.

This decision must be documented in writing using Figure 9.3a: Record of the Superintendent's Decision Regarding Installation of Automatic Fire Protection Systems and Consolidation of Collections. Copies of the documents noted in NPS Museum Fire Protection Standard (1.c) must be distributed to the AHJ or RSFM, regional director, regional curator, the park central and museum files, and historical architect advisor if appropriate.

**Figure 9.4 Sample Museum Fire Section of a Park Structural Fire Management Plan (continued)**

2. Develop and implement a Museum Fire Section as part of the park Structural Fire Management Plan (SFMP) with procedures to prevent, detect, and suppress fires. Review annually and update the Museum Fire Section every five years and after a structural fire incident, addition of a new or renovated structure to house collections, new exhibit installation, or change in curator.
3. Conduct regular self-assessments for fire risk, including the NPS Checklist for Preservation and Protection of Museum Collections, and have a structural fire protection professional complete a Fire Protection Condition Assessment (FPCA) for structures housing museum collections.
4. Include and implement corrective actions to remove, reduce, and/or mitigate fire hazards and vulnerabilities in the Museum Mitigation Action Plan.
5. House museum collections in a dedicated storage space separated from the curatorial office, research and work areas, and supply storage areas.  
House collections in spaces separated (compartmented) by appropriate fire-rated assemblies in purpose-built and adapted structures and spaces, and separate functions to the extent possible in furnished historic structures.
6. Prohibit smoking in or within 25 feet of structures and spaces housing collections.
7. House the paper accession (and deaccession) book and folders in a locking UL listed 350°F one-hour fire-resistive insulated filing cabinet, safe, or vault when not in use. House electronic museum records, backups, and other media files in a UL listed 125°F one-hour fire resistive media safe or box.
8. Store cellulose nitrate-based materials in accordance with fire safety guidelines and Director's Order 24.4.3.23: Cellulose Nitrate and Cellulose Ester Film.
9. Require a Hot Work Permit (HW-1) for hot work in spaces housing collections. Protect collections or move to a secure location during hot work.

### **Fire Protection Policies and Code References**

NPS policies and nationally recognized fire codes relating to museum fire protection include:

- NPS Management Policies (2006) 9.4.2: Museum Collections Management Facilities
- NPS-28: Cultural Resource Management Guideline
  - Chapter 4.D: Fire Management 1: Structural Fire
  - Chapter 9.B.3.b: Cataloging
- NPS Director's Order 50D: Smoking Policy
- NPS Director's Order 24: NPS Museum Collections Management, 4.3.10: Emergency Operation
- NPS Reference Manual 58: Structural Fire
  - Chapter 7: Fire Protection for Historic Structures and Buildings with Collections
  - Chapter 7, Appendix A: Structural Fire Protection of Cultural Resources in the NPS
- NFPA 909: *Code for the Protection of Cultural Resource Properties- Museums, Libraries, and Places of Worship*
- NFPA 914: *Code for Fire Protection of Historic Structures*

### **III. Designated Responsibilities**

The park *curator* or collateral duty staff designated as responsible for the museum collection is directly responsible for the physical care of, and has day-to-day on-site responsibility for the museum collection. The curator will work with the Park Structural Fire Coordinator (PSFC) and interdisciplinary team for museum fire protection to append this Museum Fire Section to the park Structural Fire Management Plan.

**Figure 9.4 Sample Museum Fire Section of a Park Structural Fire Management Plan (continued)**

The curator is responsible for developing, implementing, and updating the following, in coordination with the PSFC and facility manager:

- Museum Fire Section of the park Structural Fire Management Plan.
- Risk Assessment Worksheet (Figure 10.2).
- NPS Checklist for Preservation and Protection of Museum Collections (Appendix F, Section F: Fire).
- Museum Mitigation Action Plan (Figure 10.3).
- First Priority Criteria for Object Relocation and Salvage (Figure 10.20).
- Object Assessment (Figure 9.3).

Updates to fire detection and suppression systems in [*Hilltop House and/or the Curatorial Facility*] will be made in consultation with the Regional Structural Fire Manager (RSFM) or Authority Having Jurisdiction (AHJ) and the regional curator.

#### **Completed Risk Assessment Documents**

The following documents are filed in the curator's office in the [*Curatorial Facility*]:

- Risk Assessment Worksheet.
- NPS Checklist for Preservation and Protection of Museum Collections.
- Fire Protection Condition Assessment (FPCA).

#### **Museum Fire Protection Mitigation to be Completed**

See Museum Mitigation Action Plan (Figure 10.3) dated [*February 13, 2020*] for pending corrective actions.

#### **IV. Fire-Safe Practices in Collections and Structures Housing Collections**

Implement the following fire-safe practices in accordance with Chapter 9.E: Fire-Safe Practices and Design.

- Museum collections are housed in dedicated storage spaces separated from the curatorial office and research and work areas.
- Cabinets are raised 4 – 6 inches off the floor.
- Collections in the [*Curatorial Facility*] are stored in well-constructed, sealed steel cabinets that are closed and secured after use and at the end of each day.
- Cabinets, exhibit cases, and furniture are not closer than 18 inches from sprinkler head deflectors.
- Furniture in [*Hilltop House*] does not obstruct fire detectors.
- The accession book and folders are housed in an insulated filing cabinet with a UL listing of (350°F 1-hour) that is locked when not in use. Electronic media, including backups, are housed in a media safe or box with a UL listing of (125°F 1-hour). An electronic backup of the accession book and documents is filed off-site and with the regional curator.
- Non-collection items (packing materials, paper products, cleaning supplies, shipping boxes, etc.) are housed outside collection storage rooms and away from electrical outlets, pipes, vents and other utilities.
- Regular housekeeping in exhibits, storage and workspaces, includes:
  - maintaining clean and organized storage and work spaces
  - keeping storage areas housing collections free of clutter
  - emptying trash receptacles daily
- The following are prohibited in or adjacent to [*Hilltop House*] and the [*Curatorial Facility*]:
  - smoking in or within 25 feet of the structure, with “No Smoking” signs posted at entrances
  - open flames (including candles, fireplaces, or stoves) in or near the structure
  - lighting matches or lighters in or near the structure
  - open coil heaters or hot plates

**Figure 9.4 Sample Museum Fire Section of a Park Structural Fire Management Plan (continued)**

- Hot work permit HW-1 is required for all hot work.
- Containers of chemicals such as alcohol or Paraloid™ B-72 used in collections preparation are closed and stored after each use.
- All doors and windows are kept closed and locked when the structure is not in use or unoccupied.
- Fire-rated doors are kept closed at all times.
- Fire protection system components such as detectors or sprinkler heads are not painted over, used to support decorations or hang clothing, or used for any function other than their intended use.
- Fire-resistant interior and exterior finishes and surfaces are used in structures housing collections.

#### **V. Museum Automatic Fire Detection and Alarm Systems and Automatic Fire Sprinkler Systems**

[*Hilltop House*] and the [*Curatorial Facility*] have [*automatic fire detection and alarm systems*] and [*automatic fire sprinkler systems.*] The museum fire protection system is monitored 24/7 by a [*UL receiving and monitoring station staffed by the local fire department.*]

- [*Photoelectric intelligent addressable*] smoke detectors are installed in all structures housing collections. An incipient air sampling system is installed in [*Hilltop House*] and the [*Curatorial Facility.*]
- Fire alarm pull boxes are located near all exits in [*Hilltop House*] and the [*Curatorial Facility.*] See Figure 9.4a for floor plan.
- A wet pipe automatic fire sprinkler system was installed throughout [*Hilltop House*] in [*2017.*]
- The wet pipe sprinkler system in the [*Curatorial Facility*] was installed in [*1993.*] [*Automatic fire sprinkler system is hard-wired to a fire alarm control panel that reports to 24/7 monitoring station.*]
- The smoke detectors, monitoring system, and automatic sprinkler systems in both structures are inspected, tested, and maintained by the certified fire contractor, [*Fire Service Company*], in accordance with RM-58.6.4.5: Fire Protection Systems Inspection Testing and Maintenance, nationally recognized fire codes, and the manufacturers' specifications. The PSFC manages and schedules park-wide fire protection inspection, testing, and maintenance.
- Manually-operated water mist portable fire extinguishers are located in the [*Curatorial Facility*] and [*furnished rooms in Hilltop House.*] ABC dry chemical extinguishers are located in non-collections areas. Facilities management conducts monthly inspections. See Figure 9.4a for floor plan and Figure [*X*] in the park SFMP for a floor plan of sprinkler shutoff valves.

The museum fire protection system is linked to the park intrusion detection system. The intrusion detection system is monitored 24/7 by a [*UL receiving and monitoring station.*]

#### **VI. Fire Emergency Response**

The [*Town of Hilltop Fire Department*] responds to structural fires at [*BEHO.*] The fire department is familiarized annually with the fire protection needs of [*Hilltop House*] and the [*Curatorial Facility*], including the special needs of the museum collection. [*Station No. 1*] is located within [*three*] miles of [*Hilltop House*] and the [*Curatorial Facility.*] The nearest fire hydrant is [*¼ mile*] from [*Hilltop House.*] The average response time between the station and the location of a fire in the park is [*15*] minutes.

*The following Museum Collection Emergency Operation Plan and other park documents are attached:*

Floor Plan: Portable Fire Extinguisher and Fire Alarm Pull Box Locations (Figure 9.4a)

Floor Plan: Evacuation Routes (Figure 9.4b)

Fire Emergency Response Steps (Figure 9.9)

#### **VII. Emergency Contacts, Vendors and Sources of Assistance**

*The following documents from the Museum Collection Emergency Operation Plan are attached:*

Emergency Contact List (Figure 10.21)

Emergency Vendor and Sources of Assistance List (Figure 10.22)

**Figure 9.4 Sample Museum Fire Section of a Park Structural Fire Management Plan (continued)**



## VIII. Emergency Supplies and Equipment

*The list of Emergency Supplies and Equipment (Figure 10.23) from the Museum Collection Emergency Operation Plan are attached here.*

## IX. Salvage

Once the affected structure is cleared for re-entry, salvage can begin. Contact the regional curator and conservator before beginning salvage activities. Save as much as possible. Do the minimum amount of work per object. Ensure that actions taken to salvage collections do not damage the collections further. Interventive treatment should only be done by a conservator.

*The Salvage Procedures (Figure 10.24) from the Museum Collection Emergency Operation Plan are attached here.*

## X. Documentation

Maintain a copy of the following documents in the curatorial office in the [*Curatorial Facility*]:

- *Planning and mitigation:* Risk assessment documents, current copies of this Museum Fire Section of the SFMP, Museum Mitigation Action Plan, museum fire protection system installation documents, and related memoranda and worksheets.
- *Relocation:* Tracking and object relocation information.
- *Salvage:* Written reports and logs describing the type(s) of object damage sustained, salvage activities (freezing, drying, etc.) and who authorized them, and other related information.
- *Photographs:* Images of affected objects and spaces.
- *Distribution:* Copies of these documents are distributed to the AHJ or RSFM, regional director, regional curator, the park central and museum files, and the historical architect advisor if appropriate.

## XI. Review Cycle

Review the Museum Fire Section of the SFMP annually and update every five years and after a significant structural fire incident, addition of a new or renovated structure to house collections, new exhibit installation, or change in the designated curator.

## XII. Training and Drills

- The curator works with the PSFC and/or park safety officer to ensure the coordination and delivery of fire prevention training. All training is documented and maintained on file. Training includes how to report fires, portable fire extinguisher operating procedures, and evacuation procedures and routes.
- The PSFC conducts fire drills once a year at minimum.

## List of Figures

*The following figures are attached to this plan:*

Figure 9.3: Object Assessment

Figure 9.4a: Floor Plan: Portable Fire Extinguisher and Fire Alarm Pull Box Locations

Figure 9.4b: Floor Plan: Evacuation Routes

Figure 9.9: Fire Emergency Response Steps

Figure 10.3: Museum Mitigation Action Plan

Figure 10.20: First Priority Criteria for Emergency Relocation and Salvage

Figure 10.21: Emergency Contact List

Figure 10.22: Emergency Vendor and Sources of Assistance List

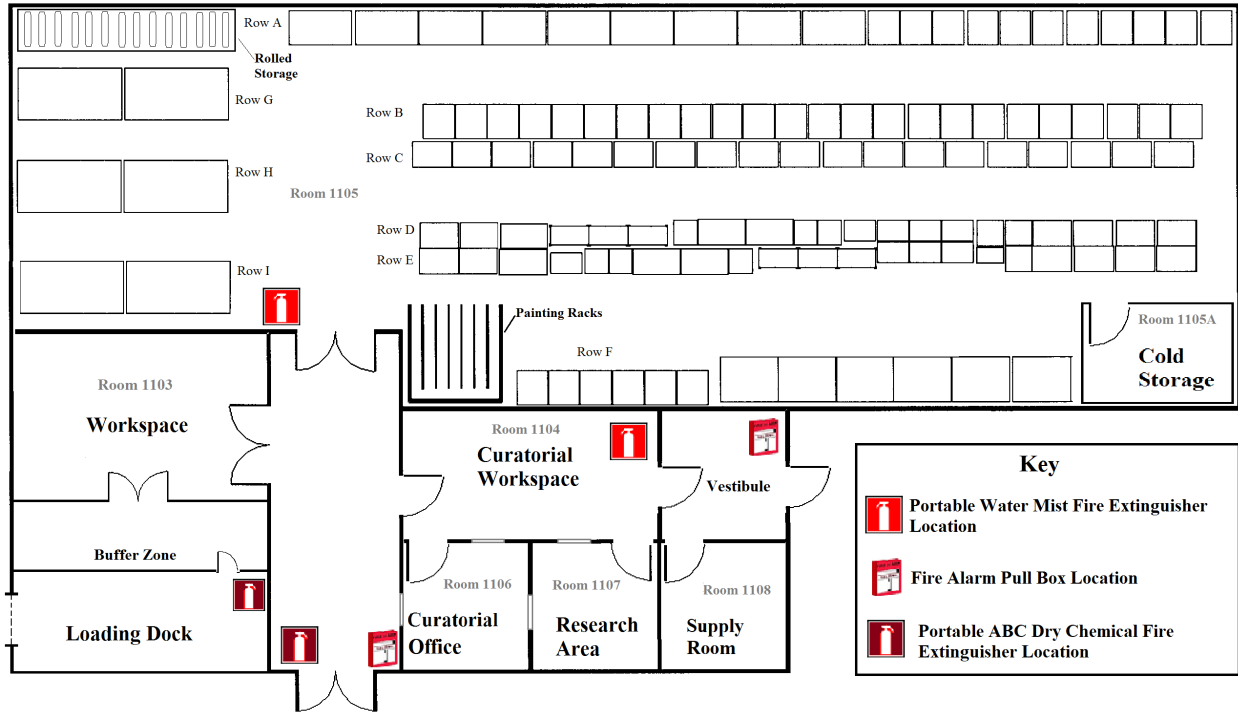
Figure 10.23: Emergency Supplies and Equipment

Figure 10.24: Salvage Procedures

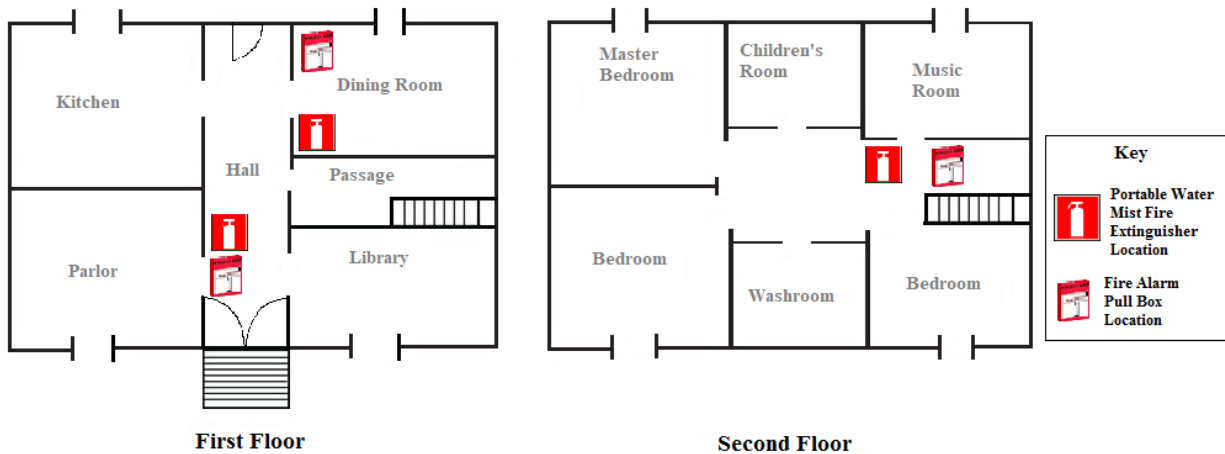
Note: The First Priority Object List for Relocation and Salvage and the First Priority Floor Plans for Relocation and Salvage are filed with restricted access in the [*curatorial office*] in the [*Curatorial Facility*].

**Figure 9.4 Sample Museum Fire Section of a Park Structural Fire Management Plan (continued)**

**Floor Plan: Portable Fire Extinguisher and Fire Alarm Pull Box Locations**



**Portable Fire Extinguisher and Fire Alarm Pull Box Location Floor Plan: Curatorial Facility**



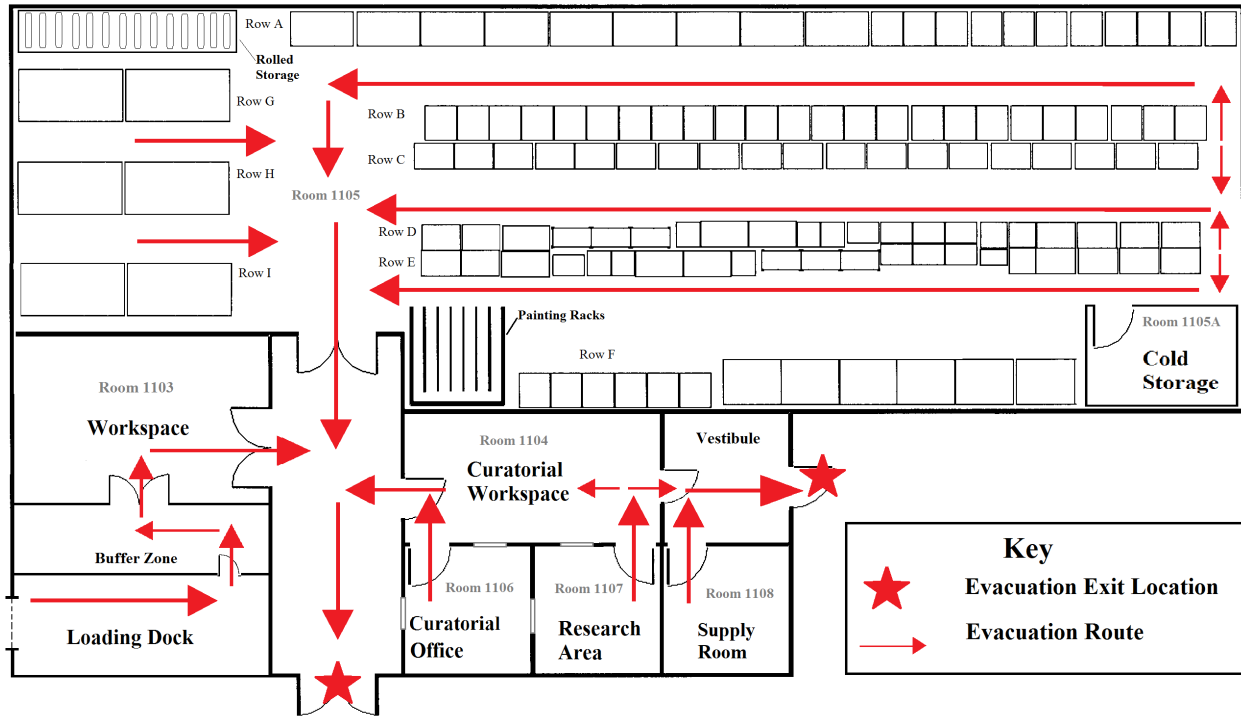
**Portable Fire Extinguisher and Fire Alarm Pull Box Location Floor Plan: Hilltop House**

See Figure [X] in park SFMP for floor plans of sprinkler shutoff valves.

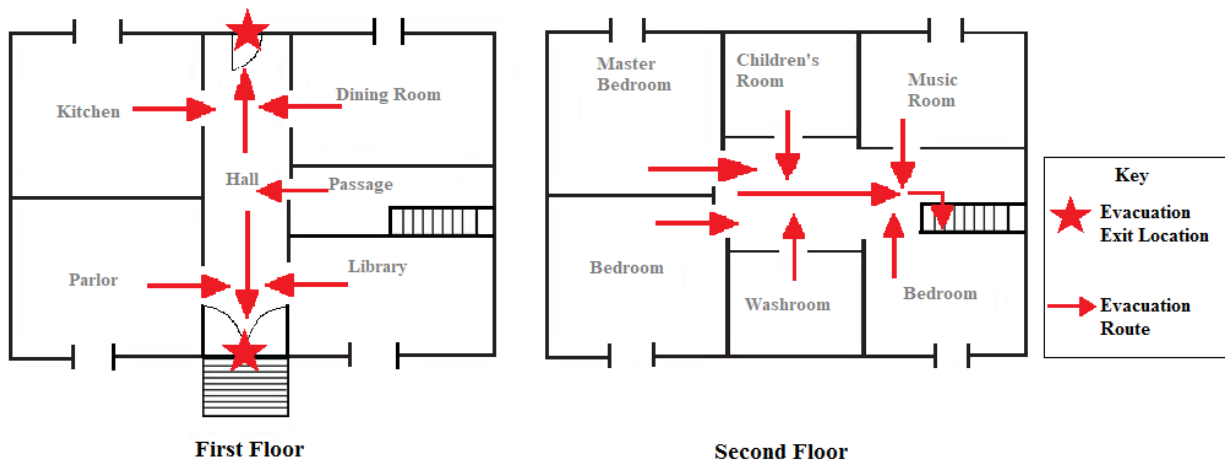
**Figure 9.4a Floor Plan: Portable Fire Extinguisher and Fire Alarm Pull Box Locations**

**Figure 9.4 Sample Museum Fire Section of a Park Structural Fire Management Plan (continued)**

**Floor Plan: Evacuation Routes**



**Evacuation Route Floor Plan: Curatorial Facility**



**Evacuation Route Floor Plan: Hilltop House**

★ Meet at the designated assembly point at the [South Parking Lot.]

**Figure 9.4b Floor Plan: Evacuation Routes**

**Figure 9.4 Sample Museum Fire Section of a Park Structural Fire Management Plan (continued)**

**Sample Language for Museum Fire Protection to be Included in a Memorandum of Understanding Between a Park and a Fire Company**

Special firefighting procedures may be necessary to safeguard museum collections and structures housing museum collections, including storage facilities, buildings, furnished historic structures, visitor centers, museums, and administrative offices. Park museum staff will provide the Town Fire Department an annual familiarization tour of the Park's museum storage facilities, buildings, work spaces, furnished historic structures, and exhibit spaces. Access points, selected museum objects in need of special attention, and hazardous non-collection materials storage will be noted on the tour.

Park staff will develop, in consultation with the Town Fire Department, appropriate arrangements for rapid entry to structures housing collections during a fire emergency.

**Figure 9.5 Sample Language for Museum Fire Protection to be Included in a Sample Memorandum of Understanding Between a Park and a Fire Company**

## Sample Statement of Work for a Fire Protection Condition Assessment (FPCA)\*

\*This sample Statement of Work was provided by the NPS Structural Fire Program.

### Part A – General Information

#### Description of Work:

The Life Safety and Fire Risk Assessment is a physical survey and a report which provides a complete evaluation of each Park structure's construction, function, operational support systems and occupancy as they impact fire protection and life safety. The report shall identify risks to life, property, or Park mission from the effects of potential fire incidents. The report shall serve as a reference document to NPS management for planning and prioritizing projects for short term work in order to maintain satisfactory facility safety, and to plan for long range decisions regarding renovation, reinvestment and preservation.

#### Qualifications & Experience:

All services under this task order shall be performed in accordance with applicable codes and NPS policy as identified in the task order and accepted industry standards. All work is to be accomplished by a registered professional fire protection engineer in the United States. Firms bidding on task orders associated with this line item will be required to appoint a senior fire protection engineer as the project manager who will be responsible for review of all submissions prior to submitting them to the NPS. Experience with condition and risk assessment procedures and work in museums and historic structures is desired and contractors may be asked to submit documentation showing experience with each.

### Part B – Scope of Services

Often several parks will be listed on a single task orders. This will require the contractor to coordinate with each park and negotiate inspection dates and times in order to accomplish several park inspections in a single trip. The Contractor shall:

- Provide all management, supervision, personnel, support services, supplies, materials and equipment necessary for the performance of the Life Safety and Fire Risk Assessment survey.
- Perform a thorough survey of the entire structure to determine how the building's features function together as a system. The building, its occupancies and operations, including structures housing museum collections, shall be considered as part of the "total system" relative to overall safety. All positive and negative aspects shall be taken into consideration.
- Review all available inspection, testing & maintenance records, as-built drawings, and operational manuals for all life safety and fire protection systems.
- Identify and analyze all of the building's major fire protection and life safety systems. Provide substantive description and profile information regarding the building's systems and features as they impact the Structural Fire program. All positive and negative aspects of the building's systems/features shall be evaluated and analyzed for their impact/contribution to the level of risk inherent in the building.
- Identify conditions within the building which must be corrected or reduced to provide the building with an acceptable level of risk. Identifying risk incorporates the evaluation of the condition and potential impact to the occupants, property and the mission of the Park. The analysis shall include justification statements that thoroughly address the hazard and the need for improvement/replacement based upon risk, life cycle cost analysis, obsolescence, excessive maintenance costs, etc.
- Determine the severity of each risk condition. The severity of each risk condition shall be based on the contractor's professional judgment and the guidance in Appendix A.
- Provide recommendations which may reflect a variety of alternatives for correcting the identified risk condition or reducing the identified risk condition to an acceptable level. Provide an estimated

Figure 9.6 Sample Statement of Work for a Fire Protection Condition Assessment (FPCA)

construction cost for each recommendation. Recommended actions shall meet the criteria or the “intent” of NPS Reference Manual 58 and NFPA Codes/ Standards.

- Provide a detailed report of the survey using the format in Attachment 1.

#### **Pre-Site Preparation:**

- The contractor shall initiate a pre-survey conference with the Park Facility Manager at least 15 calendar days before surveying begins, either by phone or in person, to discuss necessary topics and information including but not limited to:
  - The schedule and plans for conducting the survey
  - Provision of floor plans for each structure
  - Secured areas in the each structure
  - Need to perform any tasks after normal working hours
  - Types of fire protection, safety, and environmental systems in each structure
  - Scheduling of necessary personnel
  - Safety issues
- When museum collections are housed on site, the contractor shall initiate a pre-survey conference with the park museum curator or regional curator at least 15 calendar days before surveying begins, either by phone or in person, to discuss the needs of the museum collection, including but not limited to:
  - Hazardous or vulnerable objects in the museum collection
  - Location of museum fire protection, safety, and environmental system piping and components
  - Fire risk to museum collections under current conditions

#### **On-Site Procedures:**

- The Park Facility Manager (or representative) shall arrange for escort or access to all spaces the contractor needs to view.
- The park curator or regional curator shall escort the contractor through all spaces housing collections the contractor needs to view.
- The contractor shall conduct a complete and thorough walk-through of the structures and record all conditions affecting risk, both positive and negative, as deemed necessary.

#### **Assessment Report:**

Format and content, at a minimum, shall comply with Appendix A.

- The report shall describe building conditions, with explanations, which may have a significant impact, both positive and negative, on life safety, fire risk in each structure, and contents of each structure, including museum collections. The report shall analyze how conditions identified during the survey could affect the occupants, the cultural heritage or value of the property, including current fire risk to museum collections, and the mission of the Park.
- The report shall incorporate Section B of the Object Assessment (Figure 9.3), completed by the museum curator, for structures housing museum collections.
- Appropriate corrective actions for risk control shall be recommended to reduce the probability, severity or a combination of both. The contractor shall develop corrective actions with estimated costs for each risk condition noted. The recommended corrective actions shall ensure the risks have been eliminated or controlled to an acceptable level for museum collections and structures housing museum collections.
- Photographs shall be used to illustrate any adverse conditions noted as well as general facility conditions. At least one photograph shall be taken for each visible finding. Additional photographs will be provided to show each means of egress and any special or unusual conditions.
- All code, policy and other references shall be cited in the report.

**Figure 9.6 Sample Statement of Work for a Fire Protection Condition Assessment (FPCA) (continued)**

**Attachment to the FPCA Statement of Work  
FPCA Questions Related to Museum Spaces\***

\*This Attachment was provided by the NPS Structural Fire Program. It should be completed by a structural fire protection professional during the FPCA.

**Park Alpha Code:** \_\_\_\_\_  
**Facility/Location Name:** \_\_\_\_\_  
**Location FMSS ID:** \_\_\_\_\_  
**Completed by:** \_\_\_\_\_  
**Date:** \_\_\_\_\_

**Fire Detection and Fire Suppression Systems:**

Does the space/building have a fire alarm system? Y N  
 (Also see FPCA database)

Does the space / building have a fire sprinkler system? Y N  
 (Also see FPCA database)

Does the space / building have a fire suppression system? Y N  
 (Also see FPCA database)

*Installed:* Identify and confirm what systems are actually installed and whether the installation meets NFPA and manufacturers' requirements (residential systems vs commercial).  
 Comments:

*Maintained:* Confirm maintenance records exist and indicate maintenance was performed in the proper frequency by qualified personnel. Confirm inspection records exist with the proper frequency and are conducted by qualified individuals.  
 Comments:

Operational: Is each system operational? Y N  
 (Also see FPCA database)

Does the system have any visible deficiencies or code violations? Y N  
 (Also see FPCA database)

Is each system appropriate for the space? Would it be better to replace the system? If so, with what type of system (dry, double interlock, clean agent (what type clean agent))?  
 Comments:

Monitoring Station Notification: Is it working, reliable, and monitored 24/7 (with code required communication methods and lines)? Concern about reliability of phone lines and other notification strategies. If not working/reliable, recommendations for replacement? Y N  
 (Also see FPCA database)  
 Comments:

If a sprinkler system is not installed, is it possible to install one? If not, why not? (*nearest available water supply that can support an automatic sprinkler system*)  
 Comments:

Would a different type of automatic suppression (extinguishing) system work rather than an automatic sprinkler system?  
 Comments:

**Figure 9.6a Attachment to the FPCA Statement of Work: FPCA Questions Related to Museum Spaces**

**Spaces Housing Collections and Risk:**

Are installed detection systems and suppression systems reliable? (Also see FPCA database)	Y N
For example, is water available and sufficient?	Y N
Comments:	
Are 1- and/or 2-hour fire walls with appropriate fire-rated doors and windows installed for collection storage spaces? If not, are spaces separated by function?	Y N
Are penetrations appropriately sealed?	Y N
Rating of fire wall:	
If not, is retrofit possible?	Y N
Comments:	
Are 1- and/or 2-hour fire walls with appropriate fire-rated doors and windows installed for exhibit areas in visitor centers, galleries, and furnished historic structures?	Y N
Are penetrations appropriately sealed?	Y N
Rating of fire wall:	
If not, is retrofit possible?	Y N
Comments:	
Do the collections spaces (storage buildings, furnished historic structures, exhibits) have drop ceilings? If so, what areas?	Y N
Are detectors attached to them?	Y N
Are sprinklers attached to them?	Y N
Comments:	
If only parts of the building have sprinkler protection, which areas are protected with sprinklers?	
Collections storage	Y N
Exhibit galleries	Y N
Visitor center	Y N
Furnished historic structure	Y N
Are the collections stored in a basement or attic environment?	Y N
Comments:	
Is the installed sprinkler system appropriate for the space and collections, considering location, maintenance, training, and contents of the collection?	
Collections storage	Y N
Exhibit galleries	Y N
Visitor center	Y N
Furnished historic structure	Y N
Is the type of portable fire extinguisher (i.e. ABC, clean agent) in the space appropriate for the collection? Should a different type of extinguisher (i.e. water mist) be added?	
Collections storage	Y N
Exhibit galleries	Y N
Visitor center	Y N
Furnished historic structure	Y N
Comments:	

**Figure 9.6a Attachment to the FPCA Statement of Work: FPCA Questions Related to Museum Spaces (continued)**



Is the location of fire extinguishers appropriate and accessible? (Also see FPCA database)	Y N
Is the staff trained on their use? (Also see FPCA database)	Y N
Comments:	
What are the structural fire risks to the spaces housing the collections? Comments:	
<b>Containers and Enclosures:</b>	
Are the accession (and deaccession) book and folders stored in a UL listed locking fire-resistive insulated filing cabinet that will maintain under 350 degrees (F) for an hour for a fire of 1700 degrees (F)? Visually confirm. Comments:	
Are the electronic museum records, including Interior Collection Management System (ICMS) backup tapes housed in a media safe that will maintain under 125 degrees (F) for an hour in a fire of 1700 degrees (F)? Visually confirm. Comments:	
Are containers storing flammable liquids appropriate and located away from collection storage? Comments:	

**Figure 9.6a Attachment to the FPCA Statement of Work: FPCA Questions Related to Museum Spaces (continued)**

**Comparison of Selected Automatic Fire Sprinkler Systems and Suppression Systems for Museum Objects\***

<b>System Type</b>	<b>Description</b>	<b>Advantages</b>	<b>Disadvantages</b>
Wet pipe sprinkler system	<p>Sprinkler pipes are constantly filled with water</p> <p>Installed in climate-controlled structures or in climates above 40°F</p> <p>Typically used in environments that are not susceptible to freezing</p>	<ul style="list-style-type: none"> <li>– Extremely reliable</li> <li>– Faster response than dry pipe systems</li> <li>– Pipes less susceptible to corrosion than in dry pipe systems</li> <li>– Relatively easy and economical to install and maintain</li> </ul>	<ul style="list-style-type: none"> <li>– Not for use in environments susceptible to freezing</li> <li>– Accidental discharge can result in water and mold damage</li> <li>– Objects not stored in closed cabinets are susceptible to water damage</li> </ul>
Dry pipe sprinkler system	<p>Pipes are filled with pressurized air or nitrogen rather than water</p> <p>Used in climates below 40°F and in non-climate-controlled and unheated structures</p> <p>When sprinkler head is activated, compressed air is released so water can flow out of the pipes</p> <p><i>Pre-action systems</i> are a type of dry pipe system that have closed heads with no water in the piping; the fire detection system opens a valve that charges pipes with water</p>	<ul style="list-style-type: none"> <li>– Can be used in environments susceptible to freezing, typically in northern climates</li> <li>– Minimal water leakage and accidental discharge of water</li> <li>– Less likely to cause water and mold damage to collections</li> </ul>	<ul style="list-style-type: none"> <li>– Delay in initial response (code allows up to 60 seconds)</li> <li>– Requires more maintenance than a wet pipe system</li> <li>– Pipes susceptible to inline corrosion if not constantly filled with compressed air or nitrogen</li> <li>– Requires reliable power to maintain inline pressure</li> <li>– After operation, pipes can corrode if not thoroughly drained and dried</li> <li>– Objects not stored in closed cabinets are susceptible to water damage</li> </ul>
Gaseous (Clean agent) suppression system	<p>Discharges a fire extinguishing gas instead of water for total flooding of the structure</p> <p>Must comply with NFPA 2001: <i>Standard on Clean Agent Fire Extinguishing Systems</i></p>	<ul style="list-style-type: none"> <li>– Can be used in cold storage rooms and other areas subject to temperatures below 40°F and in sensitive areas</li> <li>– Eliminates the possibility of water damage to collections from fire suppression</li> </ul>	<ul style="list-style-type: none"> <li>– If not properly maintained and pressurized the system will not discharge</li> <li>– Gas requires tightly sealed compartments for effective operation</li> <li>– Suppression agent levels must be maintained for several minutes after discharge to prevent re-ignition</li> <li>– Objects not stored in closed cabinets can sustain physical damage from gas pressure and potential chemical alterations</li> </ul>
High-pressure water mist suppression system	<p>A higher pressure, low water system that discharges extremely small water particles</p>	<ul style="list-style-type: none"> <li>– Reduces potential for water damage to collections and historic fabric</li> <li>– Uses less water used than a typical wet or dry pipe system</li> <li>– Can be used to protect structures lacking water and reliable utility service</li> <li>– Can be serviced with a water storage tank or cistern</li> </ul>	<ul style="list-style-type: none"> <li>– Cost is higher than wet or dry pipe systems</li> <li>– Requires specialized design and installation expertise</li> <li>– Requires specialized inspection, testing, and maintenance expertise</li> </ul>

\*This table incorporates information from RM-58.7, Appendix A: Fire Protection System Comparisons.

**Figure 9.7 Comparison of Selected Automatic Fire Sprinkler Systems and Suppression Systems for Museum Objects**

**Comparison of Selected Portable Fire Extinguishers for Museum Objects\***  
(In alphabetical order)

<b>Extinguisher Type</b>	<b>Description</b>	<b>Advantages</b>	<b>Disadvantages</b>
ABC	Multi-purpose dry chemical extinguisher  Extinguishing agent is a fine powder  Used on Class† A, B, and C fires	<ul style="list-style-type: none"> <li>- Easy to use</li> <li>- More effective at preventing soot damage than other PFEs</li> </ul>	<ul style="list-style-type: none"> <li>- Can cause chemical damage to metals and composite objects</li> <li>- Deposits of powder can cause permanent damage if not cleaned immediately</li> <li>- Spray covers a wider area than other PFEs</li> <li>- Chemical extinguishing agent may irritate skin and eyes or pose respiratory problems</li> </ul>
Carbon Dioxide (CO <sub>2</sub> )	Uses pressurized CO <sub>2</sub> gas to displace oxygen from a fire  Used on Class B and C fires  Widely used in electrical rooms and computer rooms	<ul style="list-style-type: none"> <li>- Easy to use</li> <li>- Does not leave a residue</li> </ul>	<ul style="list-style-type: none"> <li>- Cannot be used on Class A fires, so has limited museum applicability</li> <li>- Can pose health issue if used in a contained space without respiratory protection</li> </ul>
Clean Agent	Pressurized liquid or gas extinguisher  Used on Class A, B, and C fires	<ul style="list-style-type: none"> <li>- Easy to use</li> <li>- More contained spray than ABC PFEs</li> </ul>	<ul style="list-style-type: none"> <li>- Can cause significant physical/toppling damage to freestanding objects</li> <li>- Can drive soot into organic objects</li> <li>- Can cause adhesives to swell and ink to bleed</li> <li>- Can pose a health issue if used in a very small contained space</li> </ul>
Water	Uses a stream of water (tap, deionized, or distilled) to extinguish fire  Used on Class A fires	<ul style="list-style-type: none"> <li>- Easy to use</li> <li>- Does not cause chemical damage to objects</li> <li>- Extinguishers using distilled or deionized water aid in salvaging collections wetted during a fire</li> </ul>	<ul style="list-style-type: none"> <li>- Can cause significant physical/toppling damage to freestanding objects</li> <li>- Can cause water damage to freestanding collections and structures housing collections</li> <li>- Can drive soot into organic objects</li> <li>- Can cause adhesives to swell and ink to bleed</li> <li>- Cannot be used on Class B and C fires</li> </ul>
Water Mist	Uses a fine mist of water (deionized or distilled) to extinguish fire  Pressurized using nitrogen  Used on Class A and C fires  Widely used in museum exhibit and storage areas and archives	<ul style="list-style-type: none"> <li>- Easy to use</li> <li>- Does not cause chemical damage to objects</li> <li>- Lowest risk of physical/toppling damage to freestanding objects</li> <li>- Extinguishers using distilled or deionized water aid in salvaging collections wetted during a fire</li> <li>- More contained spray than ABC PFEs</li> </ul>	<ul style="list-style-type: none"> <li>- Can cause water damage to freestanding collections and structures housing collections</li> <li>- Can drive soot into organic objects</li> <li>- Can cause adhesives to swell and ink to bleed</li> <li>- Heavier than chemical extinguishers</li> <li>- Cannot be used on Class B fires</li> </ul>

\*This table incorporates information from NFPA 10 and OSHA, "Portable Fire Extinguishers: Types of Fire Extinguishers."

†Fire Class Definitions from NFPA 10: *Standard for Portable Fire Extinguishers*:

*Class A* fires involve ordinary combustible materials, such as wood, cloth, paper, rubber, and many plastics.

*Class B* fires involve flammable liquids, combustible liquids, petroleum greases, tars, oils, oil-based paints, solvents, lacquers, alcohols, and flammable gases.

*Class C* fires involve energized electrical equipment.

**Figure 9.8 Comparison of Selected Portable Fire Extinguishers for Museum Objects**

## FIRE EMERGENCY RESPONSE STEPS

- Activate the fire alarm.
- Call 911 and park dispatch.
- Evacuate the area immediately.
- Never jeopardize your personal safety.
- Use a fire extinguisher to put out a *small fire only* if you have been properly trained.
- Do not attempt to put out a nitrate or plastics fire.
- If smoke is present, keep close to the ground. Use a wet cloth on your face as needed.
- Use stairs. Do not use elevators.
- Close doors as you evacuate to confine the fire.
- Do not open windows.
- If your clothing catches fire, **Stop — Drop — Roll**.
- Assemble at the designated meeting point.

**Figure 9.9 Fire Emergency Response Steps**

## L. Glossary

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*Air Sampling Smoke Detector:* A device that draws air through small diameter (generally less than 1/8") tubing into a detector unit that uses the ionization, photoelectric, or cloud chamber principle to analyze the quantity of smoke or combustion products in the sample. (Also called an Early Warning, Incipient, Very Early Warning Detection System, Very Early Warning Smoke Detection Apparatus, or VESDA.)

*Authority Having Jurisdiction (AHJ):* The fire and life safety technical resource responsible for enforcing nationally recognized fire codes and standards. Usually the Regional Structural Fire Manager, the AHJ may also be called the Fire Code Official (FCO).

*Automatic Fire Detection and Alarm System:* The combination of fire detectors and alarm designed to automatically detect and notify occupants and first responders of fire.

*Automatic Fire Protection System:* The combination of an automatic fire detection and alarm system and an automatic fire sprinkler and/or suppression system designed and installed to detect, control, or extinguish a fire and alert occupants, the fire department, or both, that a fire has occurred.

*Automatic Fire Sprinkler System:* A network of overhead pipes with spaced outlets (sprinkler heads) that open at a predetermined temperature to discharge liquid water onto a fire.

*Automatic Fire Suppression System:* A network of fire extinguishing agents, including gaseous ("clean") agents or water mist, installed in a structure that automatically activate to control and extinguish a fire.

*Class A Fire:* A fire in ordinary combustibles materials, such as wood, cloth, paper, rubber, and many plastics.

*Class B Fire:* A fire in flammable or combustible liquids, petroleum greases, tars, oils, solvents, lacquers, alcohols, and flammable gases.

*Class C Fire:* A fire that involves energized electrical equipment.

*Combustible Liquid:* A liquid, such as formalin, with a flash point of 100°F or greater.

*Compartmentation:* The practice of dividing a space into separate compartments to slow the spread of fire. Compartmentation is established through building materials, such as fire-rated assemblies, and is maintained through practices such as ensuring that doors are closed and fire walls are left unpierced by unnecessary piping. *See* Passive Fire Protection and Fire Prevention.

*Domestic Water Supply:* The water supply for a building's drinking and sanitary needs that may also serve as the water source for a sprinkler system.

*Dry Pipe Sprinkler System:* A sprinkler system used in areas where temperatures below 40° F are expected. Pipes are filled with air or nitrogen under pressure. When fire opens a sprinkler head, air pressure in the system drops, releasing a valve, letting water flow into pipes and discharge from the open sprinkler(s).

*Fire Code Official:* *See* Authority Having Jurisdiction (AHJ).

*Fire Damper:* A fire protection element typically installed in HVAC ducts to prevent the spread of fire. Fire/smoke dampers prevent the spread of both fire and smoke.

*Fire Detection System:* *See* Automatic Fire Detection and Alarm System.

*Fire Prevention:* Daily fire-safe practices, such as compartmentation and good housekeeping, that reduce the risk of fire and help to slow fire spread.

*Fire Protection:* Fire-rated assemblies and automatic systems in structures that slow the spread of fire, alert occupants and responders of a fire's presence, and control and extinguish the fire.

*Fire Protection Condition Assessment (FPCA):* A risk-based assessment of fire protection and personnel training programs, structural and procedural fire hazards, maintenance of protective systems, and overall effectiveness of the fire protection program conducted by a structural fire protection professional.

*Fire Protection System:* *See* Automatic Fire Protection System.

*Fire-Rated Assembly:* Any combination of fire-rated walls, doors, door frames, windows, window frames, fire barriers, and similar construction designed to prevent fire spread.

*Fire-Resistive Material:* Any construction or building material, including metal, stone, or concrete, that inherently resists fire or has been chemically treated to resist fire. Also known as “fire-resistant” material. *See* Flame-Retardant Fabric.

*Fire-Safe Practices:* Practices that prevent or limit ignition, fire spread, and the risk of fire reaching objects, including a no smoking policy, no open flame guidance, and good housekeeping.

*Fire Wall/Fire Door:* A structural component separating or subdividing structures and spaces to prevent fire spread.

*Flame Detector:* A fire detector that detects the radiant energy generated by flames. Also called a radiant energy detector.

*Flame-Retardant Fabric:* A fabric that has been impregnated, treated, or immersed in a chemical that resists burning. *See* Fire-Resistive Material.

*Flammable Liquid:* A liquid, such as ethanol, with a flash point under 100°F.

*Fuel Load:* The total mass of combustible materials in a space or structure.

*Hazard:* A natural or locational factor or human-based event (such as a volcanic eruption, arson, or wildfire) that can negatively impact life safety, collections, and structures housing collections. *See* Risk and Threat.

*Heat Detectors:* Heat-responsive devices either of the spot or line type, designed to respond when the operating element reaches a predetermined temperature (Fixed Temperature), when the temperature rises at a rate exceeding 15°F per minute (Rate-of-Rise), or when the temperature of the air surrounding the device reaches a predetermined level, regardless of the rate of temperature rise (Rate Compensation). Some have both fixed temperature and rate-of-rise features.

*Ionization Smoke Detector:* Spot type wired smoke detectors that use ionization technology to detect incipient smoke in the early stages of a fire event. They are more responsive to invisible particles produced by most flaming fires, and are less responsive to larger particles typical of most smoldering fires.

*Laser Detectors:* Spot type wired heat detectors that use lasers to provide very early warning of incipient fire conditions.

*Local Alarm System:* A fire or intrusion detection system that causes an audible or visual alarm at the protected site, but which is not monitored off-site. Note: This type of system should not be installed in structures housing collections because it does not notify fire responders of a fire.

*Mitigation:* Reducing the severity of damage caused by fire or other emergencies by minimizing or eliminating risk factors.

*Museum Fire Section:* The section of the park Structural Fire Management Plan (SFMP) that specifically addresses the needs of museum collections. It covers mitigation, control and response, and collections salvage strategies to reduce the likelihood and severity of fire damage to collections housed in storage, work and exhibition spaces, and furnished historic structures. It includes floor plans.

*Museum Mitigation Action Plan:* A plan with specific action items to reduce deficiencies in storage, exhibit, and work spaces that could cause or increase the risk of fire or other emergencies.

*Ordinary Combustibles:* Substances such as wood or paper that can be ignited in a Class A Fire.

*Performance-Based Design:* A flexible design process that determines code-compliant fire protection systems and/or building modifications based on the specific characteristics of each structure in consultation with an AHJ, rather than requiring all structures to conform to a single set of specifications in a fire code.

*Photoelectric Smoke Detector:* Spot type wired smoke detectors that use photoelectric technology to detect incipient smoke in the early stages of a fire event. They are more responsive to larger particles typical of smoldering fires.

*Portable Fire Extinguisher (PFE):* A portable device, operated by hand, containing an extinguishing agent that can be expelled under pressure for the purpose of suppressing or extinguishing fire.

*Pre-Action Sprinkler System:* A type of dry pipe sprinkler system with the water supply controlled by a fire detection system (either smoke or heat detection) wired so an alarm opens a valve to let water flow into the system piping. After the supply valve opens, the system operates like a wet pipe system.

*Projected Beam Detector:* A type of photoelectric light obscuration smoke detector consisting of a transmitter and receiver connected to a fire alarm circuit that generate a beam spanning the protected area. They are typically used in open spaces such as open atriums and large halls.

*Risk:* The combination of hazards (or threats) and vulnerabilities faced by collections as the result of a fire or other emergency event.

*Risk Assessment:* Analyzing hazards (or threats) and vulnerabilities and their probability of occurrence, identifying possible ways losses can occur and developing corrective action steps to prevent or reduce losses and damage to collections, structures housing collections, and life safety from emergency events.

*Severity:* The level of damage sustained by collections and structures housing collections as a result of a fire or other emergency.

*Sprinkler System:* See Automatic Fire Sprinkler System.

*Standpipe System:* A piping system in a building to which hoses are connected for emergency use by building occupants or by the fire department. Standpipe systems intended for occupant use are not permissible in NPS structures.

*Structural Fire Management Plan (SFMP):* A park document that describes operational policies and procedures necessary to establish and implement the park's structural fire prevention and protection program. It should include a Museum Fire Section detailing specific steps to protect museum collections and structures housing collections from fire damage.

*Suppression System:* See Automatic Fire Suppression System.

*Threat:* A natural or locational factor or human-based event that can cause harm to life safety, collections, and structures housing collections. See Hazard and Risk.

*UL Listed Cabinet:* A storage cabinet tested and confirmed to meet Underwriters Laboratories' safety regulations. Fire-resistive museum storage cabinets carry a UL listing class of 350 1-hour, indicating that the cabinet's internal temperature will not exceed 350°F when exposed to external temperatures over 1700°F for at least one hour.

*UL Listed Media Safe:* A storage cabinet designed to house digital records, magnetic media, and/or photographic negatives and slides that has been tested and confirmed to meet Underwriters Laboratories' safety regulations. Fire-resistive media safes carry a UL listing class of 125 1-hour, indicating that the internal temperature of the safe will not exceed 125°F when exposed to external temperatures over 1700°F for at least one hour.

*Vulnerability:* The likelihood that a collection will sustain damage, based on its composition, ease of object removal before or during a fire or other emergency event, and the features of the structure(s) housing collections. See Risk.

*Wet Pipe Sprinkler System:* A sprinkler system in which the piping permanently contains water. It cannot be used in environments below 40°F, as these environments can cause the pipes to freeze.

Definitions in this Glossary adapted from:

NFPA 10: *Standard for Portable Fire Extinguishers*

NFPA 557: *Standard for Determination of Fire Loads for Use in Structural Fire Protection Design*

NFPA 701: *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.*

NFPA 703: *Standard for Fire Retardant—Treated Wood and Fire-Retardant Coatings for Building Materials.*

## M. Abbreviations Used in this Chapter

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AHJ	Authority Having Jurisdiction
COR	Contracting Officer's Representative
DO	Director's Order (NPS)
DOI	Department of the Interior
FCO	Fire Code Official
FMSS	Facility Management Software System
FPCA	Fire Protection Condition Assessment
HDPE	High Density Polyethylene
HVAC	Heating, Ventilation, and Air Conditioning
ICC	International Code Council
ICMS	Interior Collection Management System
IBC	International Building Code
IFC	International Fire Code
IWUIC	International Wildland-Urban Interface Code
MCEOP	Museum Collection Emergency Operations Plan
MDF-FR	Flame-Resistant Medium-Density Fiberboard
MHI 9.B.1	<i>Museum Handbook I</i> Chapter 9.B.1: NPS Museum Fire Protection Standards
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NCSHPO	National Council of State Historic Preservation Officers
NFPA	National Fire Protection Association
NICET	National Institute for Certification in Engineering Technologies
NIFC	National Interagency Fire Center
NPS	National Park Service
OSHA	Occupational Safety and Health Administration
PFE	Portable Fire Extinguisher
PMIS	Project Management Information System
PSFC	Park Structural Fire Coordinator
RAC	Risk Assessment Code
RERE	Repair and Rehabilitation
RSFM	Regional Structural Fire Manager
RM	Reference Manual (NPS)
SDS	Safety Data Sheet
SFMP	Structural Fire Management Plan
SOW	Statement of Work
UL	Underwriters Laboratory
VESDA	Very Early Warning Smoke Detection Apparatus



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