

National Park Service
Structural Fire Design Guide
Appendix D



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Table of Contents

1. GOALS AND OBJECTIVES	1
1.1 SCOPE	1
1.2 APPLICABILITY	1
1.3 RESPONSIBILITIES.....	1
1.3.1 FIRE CODE OFFICIAL (FCO).....	1
1.3.2 DESIGNERS.....	1
1.3.3 INTERDISCIPLINARY TEAM (IDT).....	1
1.3.4 DENVER SERVICE CENTER FIRE PROTECTION ENGINEER (DSC FPE).....	1
1.3.5 PUBLIC UTILITY COORDINATION	1
2. AUTHORITIES.....	1
2.1 MODIFICATIONS AND ALTERNATIVE MATERIALS, DESIGN, AND METHODS OF CONSTRUCTION AND EQUIPMENT	2
2.2 CODE ANALYSIS	2
2.3 DSC FPE WORKFLOWS SITE.....	3
3. FIRE ALARM SYSTEMS.....	3
3.1 SPECIAL REQUIREMENTS	3
3.1.1 FIRE ALARM DESIGNER QUALIFICATIONS.....	3
3.1.2 FIRE ALARM INSTALLER	3
3.1.3 ALL OTHER SYSTEMS.....	4
3.2 FIRE ALARM COMMUNICATION.....	4
4. WATER SUPPLY FOR FIRE PROTECTION.....	4
4.1 FIRE HYDRANTS.....	4
5. FIRE SUPPRESSION SYSTEMS	4
5.1 QUALIFICATIONS.....	4
5.1.1 SPRINKLER SYSTEM DESIGNER.....	4
5.1.2 SPRINKLER SYSTEM INSTALLER	4
5.1.3 HOOD AND SPECIALTY SUPPRESSION SYSTEMS.....	4
5.1.4 SPECIAL HAZARD SYSTEMS.....	4
5.1.5 ALL OTHER SYSTEMS.....	4
5.2 SPRINKLER PIPING.....	5
5.3 FIRE DEPARTMENT CONNECTIONS AND STANDPIPES	5
6. NON-WATER-BASED FIRE SUPPRESSION SYSTEMS.....	5

7. PORTABLE FIRE EXTINGUISHERS	5
8. ELEVATOR SYSTEMS.....	5
9. SPECIAL FIRE PROTECTION REQUIREMENTS.....	5
9.1 SLEEPING ACCOMMODATIONS	5
9.2 FIRE PROTECTION FOR HISTORIC STRUCTURES AND BUILDINGS STORING/EXHIBITING MUSEUM COLLECTIONS.....	5
9.3 ENERGY STORAGE SYSTEMS (ESS) AND PHOTOVOLTAIC (PV) SYSTEMS	6
9.3.1 LITHIUM-ION BATTERY CHARGING AND STORAGE AREAS.....	6
10. FIRE SAFETY DURING CONSTRUCTION AND DEMOLITION	6
11. PROJECT CLOSEOUT	6
11.1 TEMPORARY FIRE AND LIFE SAFETY CERTIFICATE OF COMPLIANCE	7
11.2 CERTIFICATE OF OCCUPANCY	7
12. REGION SPECIFIC REQUIREMENTS.....	7
12.1 NATIONAL CAPITAL REGION (NCR) REQUIREMENTS.....	7
13. WILDLAND-URBAN INTERFACE (WUI).....	7

1. GOALS AND OBJECTIVES

The goal of the National Park Service (NPS) Structural Fire Design Guide is to provide designers with a stand-alone document that outlines NPS special and unique requirements. This document is not intended to create new policy requirements, only to centralize existing policy requirements and best practices or guidelines. This document should be an easy-to-use summary for designers.

1.1 SCOPE

The scope of this design guide is to highlight all the design and construction requirements of Reference Manual 58 (RM-58): Structural Fire Management and other applicable authorities referenced in Section 2. This design guide may not include all national and regional requirements for design and construction.

1.2 APPLICABILITY

This design guide applies to all NPS owned buildings, including those managed by concessions. Consider following this design guide for buildings planned to be donated to the NPS.

1.3 RESPONSIBILITIES

1.3.1 FIRE CODE OFFICIAL (FCO)

The regional structural fire marshal is the fire code official (FCO). This person is also considered the authority having jurisdiction (AHJ) under National Fire Protection Association (NFPA) codes and standards. The FCO may delegate certain responsibilities (e.g., acceptance testing) to other individuals.

1.3.2 DESIGNERS

The designers include, but are not limited to, architects, engineers, and contractors/subcontractors developing shop drawings. All designers are responsible for ensuring their design complies with RM-58 and all applicable codes and standards. The designer is responsible for having open dialogue with the FCO and park interdisciplinary team (IDT) and incorporating their review comments.

1.3.3 INTERDISCIPLINARY TEAM (IDT)

An IDT may be composed of any combination of the following:

- Designers (e.g., architects, engineers, landscape architects)
- Planners
- Resource/compliance specialists
- Park, regional, Washington Support Office (WASO), Denver Service Center (DSC), and concessions employees
- Individuals from other federal, state, tribal, and local government agencies

The IDT is responsible for professional collaboration with the common goal of ensuring a safe and successful project.

1.3.4 DENVER SERVICE CENTER FIRE PROTECTION ENGINEER (DSC FPE)

For Denver Service Center (DSC) managed projects, the DSC FPE shall be part of the IDT.

1.3.5 PUBLIC UTILITY COORDINATION

Designers and installers are responsible for coordination with all public utilities, including but not limited to, water and electric providers.

2. AUTHORITIES

Authorities for the management of structural fire within the NPS include the latest adopted versions, editions, and appendices of the following:

- Code of Federal Regulations (CFR)
- United States Department of the Interior (DOI), Departmental Manual (DM)
- National Park Service *Management Policies* 2006
- Director's Order 58 (DO-58): Structural Fire Management
- Reference Manual 58 (RM-58): Structural Fire Management
- International Fire Code (IFC), as adopted and modified in RM-58, Appendix A
- International Wildland-Urban Interface Code (IWUIC)
- National Fire Protection Association (NFPA) codes and standards, where referenced in IFC
- Occupational Safety and Health Administration (OSHA)
- Director's Order 50B (DO-50B): Occupational Safety and Health Program
- Reference Manual 50B (RM-50B): Occupational Safety and Health Program
- NFPA 914: *Code for Fire Protection of Historic Structures*
- NFPA 909: *Code for the Protection of Cultural Resource Properties – Museums, Libraries and Places of Worship*
- Public Buildings Amendment Act of 1988
- *Museum Handbook*

2.1 MODIFICATIONS AND ALTERNATIVE MATERIALS, DESIGN, AND METHODS OF CONSTRUCTION AND EQUIPMENT

Occasionally, there are practical difficulties involved in carrying out the provisions of the IFC. The FCO shall have the authority to grant modifications or approve an alternative material, design, or method of construction and equipment provided the proposed design is satisfactory and complies with the intent of the provisions of the code, and does not lessen health, life, and fire safety requirements. The material, method, or work offered will not, in the discretion of the FCO, be less than the equivalent of that prescribed in the IFC in quality, strength, effectiveness, fire resistance, durability, and health, life, and safety requirements.

Any approvals of modifications or alternative materials, design, and methods of construction and equipment shall be documented by the FCO and kept on file by the park and region with other documentation related to the building. The details of the action granting modifications or alternative materials, design, and methods of construction and equipment shall be recorded and entered in the Facility Management Software System (FMSS) at the location level, if the decision involves the building itself, or at the asset level, if the decision involves only the asset. Research reports and/or further associated testing may be required to achieve a favorable outcome with an alternative materials, design, and methods request. The details of modifications or alternative materials, design, and methods of construction and equipment are covered in IFC, Chapter 1, Scope and Administration.

2.2 CODE ANALYSIS

A code analysis is required to be included in design packages and shall be based on NPS adopted codes. The code analysis shall include, but is not limited to, the following elements:

- Project description narrative
- Occupancy classification
- Decorative structures
- Design - unique aspects
- Doors
- Egress
- Elevators
- Finishes
- Ceiling

- Floor
- Interior Wall
- Fire Alarm
- Communication System
- Detection
- Fire Department Access
- Fire Resistive Separations
- Power
 - Emergency
 - Standby
- Smoke Management Description
- Suppression Systems
- Windows
- Wildland-urban interface (WUI)

Code analyses are generally seen on a general page in the drawings, usually in a table format with four columns. Column one includes the topics referenced above. Column two includes what is required by applicable codes with citations. Column three is what is required by RM-58 or any other NPS specific requirement with citations. Column four outlines what is being provided under the current project's scope.

2.3 DSC FPE WORKFLOWS SITE

The DSC has a website outlining specific requirements for DSC managed projects. These requirements may be utilized on all NPS projects. See site link below.

[DSC Fire Protection Engineering Workflows](#)

3. FIRE ALARM SYSTEMS

Fire alarm systems must be installed in accordance with the requirements in the IFC, and where referenced NFPA 72: *National Fire Alarm and Signaling Code*. All documentation requirements in NFPA 72 are required to be submitted for review and approval by the FCO.

3.1 SPECIAL REQUIREMENTS

The following requirements take precedence over the requirements in NFPA 72 and the IFC:

1. Qualifications for installers and designers (see Section 3.1.1, 3.1.2, and 3.1.3 below)
2. *Museum Handbook, Part I, Chapter 9* requirements
3. Where voice evacuation systems are used, prerecorded messages shall be approved by the FCO and park.

3.1.1 FIRE ALARM DESIGNER QUALIFICATIONS

Fire alarm designers shall meet one or more of the following qualifications:

1. A licensed fire protection engineer
2. A National Institute for Certification in Engineering Technologies (NICET) Level III (or higher) Technician for the type of system designed
3. As approved by the FCO

3.1.2 FIRE ALARM INSTALLER

The fire alarm installer shall meet one or more of the following qualifications:

1. State or municipal certified/licensed fire alarm contractor
2. Qualified by the manufacturer
3. NICET Level II (or higher).

4. As approved by the FCO

3.1.3 ALL OTHER SYSTEMS

1. State or municipal certified/licensed contractor for the type of system
2. Qualified by the manufacturer
3. As approved by the FCO

3.2 FIRE ALARM COMMUNICATION

Fire alarm communication methods shall meet the requirements of NPFA 72 as referenced by the IFC. Fire alarm communication methods should be discussed early in the design process.

4. WATER SUPPLY FOR FIRE PROTECTION

Water supplies for fire protection shall meet the requirements of the IFC.

4.1 FIRE HYDRANTS

Designers and installers must coordinate the location of fire hydrants and thread types for hydrant outlets with responding fire department(s) in concurrence with the FCO.

5. FIRE SUPPRESSION SYSTEMS

Fire suppression systems must be installed in accordance with the requirements in the IFC and other codes or standards referenced therein. All documentation requirements in the IFC and applicable NFPA codes or standards regarding suppression systems are required to be submitted for review and approval by the FCO.

5.1 QUALIFICATIONS

Designers and installers shall meet the following qualifications.

5.1.1 SPRINKLER SYSTEM DESIGNER

1. A licensed fire protection engineer
2. NICET Level III (or higher) Technician in water-based systems layout
3. As approved by the FCO

5.1.2 SPRINKLER SYSTEM INSTALLER

1. State or municipal certified/licensed sprinkler contractor
2. NICET Level II (or higher)
3. As approved by the FCO

5.1.3 HOOD AND SPECIALTY SUPPRESSION SYSTEMS

1. State or municipal certified/licensed contractor for the type of system
2. Qualified by the manufacturer
3. As approved by the FCO

5.1.4 SPECIAL HAZARD SYSTEMS

1. State or municipal certified/licensed contractor
2. NICET Level II (or higher)
3. As approved by the FCO

5.1.5 ALL OTHER SYSTEMS

1. State or municipal certified/licensed contractor for the type of system
2. Qualified by the manufacturer

3. As approved by the FCO

5.2 SPRINKLER PIPING

Pipe used for sprinkler systems should be Schedule 40 black steel, up to and including 4-inch diameter, unless otherwise approved by the FCO. All other pipe specifications shall comply with NFPA 13: *Standard for the Installation of Sprinkler Systems*.

Dry pipe and pre-action systems should incorporate corrosion protection.

Main drain piping discharge shall be to the exterior of all structures, unless otherwise approved by the FCO.

5.3 FIRE DEPARTMENT CONNECTIONS AND STANDPIPES

Designers and installers must coordinate location, type, and signage with the responding fire department(s), pending FCO approval.

6. NON-WATER-BASED FIRE SUPPRESSION SYSTEMS

Non-water-based fire suppression systems may be considered for use in the NPS when water-based systems are not preferred. These types of systems require consultation with the FCO and park staff early in the design process due to higher life-cycle costs and appropriateness for use.

7. PORTABLE FIRE EXTINGUISHERS

Portable fire extinguishers in historic structures require discussion with the FCO to determine appropriate agent type, location, and mounting method. Fire extinguishers should be considered in R-3 occupancies and structures that are governed by the International Residential Code (IRC).

8. ELEVATOR SYSTEMS

All new and replacement elevator systems should consider ambulance cot sizing for maneuverability. Traction elevators reduce the amount of fire protection equipment in elevator hoistways.

9. SPECIAL FIRE PROTECTION REQUIREMENTS

This section highlights special requirements for fire protection systems that exceed typical code requirements.

9.1 SLEEPING ACCOMMODATIONS

Smoke alarms (hardwired or wireless) shall be installed to meet the requirements of the IFC and where referenced NFPA 72. This requires smoke alarms in each sleeping room, outside each sleeping area, and on every level of a structure.

Carbon monoxide (CO) alarm/detection shall be installed in new and existing sleeping accommodations in accordance with the requirements of the IFC.

An automatic sprinkler system shall be installed in all new sleeping accommodations in accordance with IFC requirements for residential occupancies.

9.2 FIRE PROTECTION FOR HISTORIC STRUCTURES AND BUILDINGS STORING/EXHIBITING MUSEUM COLLECTIONS

The NPS *Museum Handbook*, Part I, Chapter 9 contains specific fire protection requirements for occupancies with museums and museum collections, which include the following:

- Install automatic fire detection and suppression systems in all structures housing or exhibiting museum collections as approved by the FCO in consultation with the park or regional museum curator and interdisciplinary team.
- For historic structures, design and install automatic fire protection systems with minimum impact to the historic fabric and character in consultation with the historical architect advisor and interdisciplinary team.
- Make spaces that house museum collections fire-resistant to the extent possible.
- Spaces specifically designed to house collections shall be separated from all other spaces, including work and break rooms.

Facilities designated as historic buildings shall meet the requirements of NFPA 909: *Code for the Protection of Cultural Resource Properties – Museums, Libraries, and Places of Worship*, and NFPA 914: *Code for the Protection of Historic Structures*.

All historic structures shall be protected with arc fault circuit interrupters (AFCIs) as required by NFPA 914 and installed per NFPA 70: *National Electrical Code*.

Location of lock boxes on historic structures shall be coordinated with the FCO and appropriate park staff.

9.3 ENERGY STORAGE SYSTEMS (ESS) AND PHOTOVOLTAIC (PV) SYSTEMS

All proposed ESS and PV locations must be reviewed and approved by the FCO. Installation of ESS and PV in historic buildings shall follow applicable IFC, and where referenced, NFPA requirements. Installation of ESS in historic buildings is not recommended.

9.3.1 LITHIUM-ION BATTERY CHARGING AND STORAGE AREAS

Lithium-ion battery charging and storage areas in historic structures shall comply with NFPA 914.

10. FIRE SAFETY DURING CONSTRUCTION AND DEMOLITION

All projects within the NPS shall consider fire safety during construction and demolition. Site safety plans shall be developed in accordance with the IFC, Chapter 33, Fire Safety During Construction and Demolition.

11. PROJECT CLOSEOUT

All projects require a Fire and Life Safety Certificate of Compliance issued by the FCO upon:

- Substantial completion of construction
- Successful acceptance testing of all fire and life safety systems

It is the responsibility of the construction contractor to coordinate all inspection and testing with the FCO, providing adequate notice. A representative of the installation company who possesses one of the qualifications listed in Section 5.1 must be present at acceptance testing to perform all the required tests to demonstrate the new system's performance.

All documentation listed below, but not limited to, shall be available to the FCO during inspection and acceptance testing.

- Above ground test certificate (automatic sprinkler)
- Underground test certificate (fire hydrant and sprinkler system water supply)
- Backflow prevention device certificate

- Fire alarm record of completion (fire alarm system acceptance document)
- Suppression system record of completion (suppression system acceptance test)

11.1 TEMPORARY FIRE AND LIFE SAFETY CERTIFICATE OF COMPLIANCE

The FCO may issue a temporary fire and life safety certificate of compliance prior to project closeout, provided that such portion or portions of an affected area can be occupied safely. The FCO shall set a time during which the temporary fire and life safety certificate of compliance is valid.

11.2 CERTIFICATE OF OCCUPANCY

Certificates of occupancy are under the authority of the NPS Building Code Program.

12. REGION SPECIFIC REQUIREMENTS

The regions within the NPS may have different priorities and concerns. Each FCO may have special requirements or preferences that should be incorporated into designs. Open and regular conversations should happen between the FCO, or their designee, to ensure all fire protection concerns are addressed.

12.1 NATIONAL CAPITAL REGION (NCR) REQUIREMENTS

All projects within the NCR shall incorporate requirements of the “NCR Fire Protection Systems Policy and Scope of Works” document. This document can be obtained through the NCR FCO.

13. WILDLAND-URBAN INTERFACE (WUI)

All projects in the wildland-urban interface shall comply with the International Wildland-Urban Interface Code (IWUIC). Projects in the WUI will involve consultation with the FCO.