

VA



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of Veterans Affairs

FIRE PROTECTION DESIGN MANUAL

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**Veterans Health Administration
Office of Occupational Safety Health (19HEF)**

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DEPARTMENT OF VETERANS AFFAIRS FIRE PROTECTION DESIGN MANUAL

INTRODUCTION

The primary goal of this manual is to provide an environment for occupants that is reasonably safe from fire and products of combustion. To achieve this goal, the objectives are to protect occupants who are not intimate with initial fire development for the time needed to take appropriate action, and to improve the survivability of occupants who are intimate with initial fire development.

The secondary goals of this manual are to provide a reasonable level of building usability and property protection from the effects of fire and products of combustion. To achieve these goals, the objectives are to increase the likelihood that, in the event of a fire, critical operational functions are not interrupted for longer than 24 hours and the loss of VA-owned real or personal property does not exceed \$500,000.00.

The criteria in this manual are based on the assumption of a single fire source.

1. GENERAL

1.1 Scope:

- A. This manual contains fire protection engineering design criteria to meet the goals identified above, by protecting patients, visitors, and staff; maintaining the continuity of important clinical and administrative activities; and protecting VA property. This generally will require the installation of automatic sprinkler protection in VA owned buildings. In VA occupied buildings, sprinkler protection is required to protect VA property or for compliance with NFPA 101 or the Federal Fire Safety Act PL-102-522. See [Section 6.1](#).

Note: Protection is not required to limit the loss of non-VA property.

- B. This manual applies to all categories of VA construction and rehabilitation projects, station level projects, and acquisition of all VA property. The requirements in the manual will apply to leases if deemed appropriate.

Note: This requirement above for leased facilities is in accordance with a policy memo dated October 12, 2017 from the Associate Executive Director, Office of Construction & Facility Management (003C).

- C. This manual supersedes new construction criteria contained in VA Publications that are dated prior to the publication date of this manual.
- D. This manual is intended to apply to new construction. It can be used as guidance with respect to existing features but is not intended to be applied retroactively to existing facilities.

1.2 Application:

- A. Use this manual in conjunction with the Scope of the “Fire Protection Engineer - Qualifications and Scope of Services” document on the Technical Information Library and [PG-18-15, Minimum Requirements for A/E Submissions](#), which defines the information to be shown on drawings and work to be completed at each stage of design. In addition, coordinate with requirements from other applicable VA criteria listed in Appendix C and in the [VA Technical Information Library](#).



- B. The facility must solicit the services of a third party with knowledge of applicable fire protection criteria such as the respective Network Safety Manager, Network Safety and Fire Protection Engineer (SFPE), or other qualified fire protection engineering consultant during design in order to insure the project as designed by the A/E complies with such criteria. Obtaining these third-party services early in the design process is strongly recommended.
- C. For code interpretation and enforcement, the Authority Having Jurisdiction (AHJ) for all VA projects is ultimately the Assistant Under Secretary for Health for Support Services (19), with the Safety and Fire Protection Engineer (19HEFB) acting as the VA Fire Marshal. At the Medical Center and Veterans Integrated Service Network (VISN) level, the respective Network Safety Manager or Network Safety and Fire Protection Engineer (SFPE) has the option to act as the AHJ representative on behalf of 19HEFB and make local AHJ decisions in areas where they are competent.

1.3 Fire Protection Codes and Standards:

- A. The Public Buildings Amendment Act (PL 100-678) requires all federal agencies to follow the latest editions of nationally recognized fire and life safety codes. It also requires federal agencies to give local fire protection officials the opportunity to review and comment on projects for compliance with local regulations and compatibility with local fire fighting practices. All reviews by local fire protection officials must be at no cost to the Government. Designers should meet with local fire authorities during early stages of design to incorporate local requirements to the extent practical; however, recommendations made by local officials should be reviewed for adequacy, cost, and nationally accepted practice before being incorporated into project design.
- B. VA has adopted the National Fire Codes (NFC) published by the National Fire Protection Association (NFPA), which establish a minimum acceptable level of life safety and property protection. Life safety requirements are specifically addressed in NFPA 101. Where conflicts exist between codes, the designer must follow the code specified in the text under the subject section of this manual. Fire Protection design must be based on the latest editions of the NFC at the Date of Award of the contract to the Architectural/Engineering (A/E) firm (or Design/Build firm). Under special circumstances, the VA will require compliance with a more recent code edition when significant changes to the code have occurred between the Date of Award to the A/E and the Date of Award to the prime contractor for construction.

Note: Special circumstances would include a situation where a designed project sat “on the shelf” for an extended period of time, or where a significant change to the code was made and where incorporating that change would improve safety in the opinion of the AHJ.

Note: The term code above should be understood to mean code or standard. For example, if an update to NFPA 13 (an NFPA standard, not a code) has occurred between the Date of Award to the A/E and the Date of Award to the prime contractor, VA may want to require compliance with the updated standard.

- C. Fire protection features not addressed by the NFC or otherwise addressed by this document must be designed to comply with the requirements of the latest edition of the International Building Code (IBC). See Program Guide PG-18-3 Topic 1. Other references are listed in Appendix B.



- D. For design features that are addressed by both the IBC as well as by NFPA 101 or a document referenced by NFPA 101, the requirements of NFPA 101 or the document referenced by NFPA 101 must be used exclusively (this applies even if the IBC requirements are different).

Note: VA buildings must meet the requirements of NFPA 101, and documents referenced by NFPA 101 in order to comply with the accreditation requirements of the Joint Commission. It is intended that life safety and fire protection features will be designed in accordance with the requirements of NFPA 101 and documents referenced by NFPA 101. Other building features (including, but not limited to, structural strength, stability, sanitation, adequate light and ventilation, and energy conservation) will be designed in accordance with the IBC and documents referenced by the IBC or as identified in VA Program Guide [PG-18-3](#), Topic 1 – Codes, Standards, and Executive Orders.

- E. Strict compliance to codes and standards is mandatory for new construction.

1.4 Fire Protection During Construction:

- A. Coordinate with the facility prior to and concurrent with design.
- B. Fire protection during construction must comply with VA Master Construction Specifications. (Note: Specification Section 01 35 26 , Safety Requirements, addresses NFPA 241, Joint Commission Interim Life Safety Measures, Hot Work Permits, etc..)
- C. Separate all occupied areas from demolition, rehabilitation, or construction activities by temporary smoke-tight construction partitions of gypsum board or other approved non-combustible or limited-combustible material. Partitions must be full height, extending through suspended ceilings to the floor slab or roof deck above and must be one-hour fire rated, unless sprinklers are installed and are operational on both sides of the temporary partition whereupon the partition may be permitted to terminate at the ceiling in accordance with NFPA 241. Where the ceiling on one side of the temporary construction barrier has been removed, the temporary partition must extend to the deck above.

Note: This requirement is due to the inherently greater potential for fire or hazardous materials incidents associated with the combustibles and operations of demolition/construction. This risk is made worse by the likelihood of compromised fire protection systems and fire or smoke resistant construction. This does not obviate the need to provide other protective measures to contain dust and debris as specified by VA Master Specification Section 01 35 26 1.14 (D).

Sprinklers are considered to be operational when they are installed in accordance with NFPA 13 (spacing, protection, distance from the ceiling, etc.) and there is a sufficient automatic water supply. If the ceiling was removed and the sprinklers remain at the original ceiling level, they would likely not be considered operational. See the [VHA-Joint Commission Clarification Document](#). That document permits the use of fire-retardant plastic as a temporary barrier in some instances.

- D. Phase construction as necessary to ensure that obstruction of exits is minimized or avoided. If exits are obstructed during construction, provide alternate exit routes during each phase of construction and identify the alternate routes on the construction drawings.
- E. Minimize or avoid disruptions to fire alarm and sprinkler systems. Delineate phasing of construction to ensure that installations of new systems are expedited, and where possible, maintain existing systems in service until the replacement system is operational. If fire protection systems are to be disrupted, ensure procedures are incorporated to maintain



equivalent levels of fire protection and provide formal notification to the facility while systems are down.

1.5 Americans with Disabilities Act (ADA): Fire Protection requirements of ADA do not apply to federal agencies. VA is required to comply with the Architectural Barriers Act Accessibility Standard (ABAAS) for Federal Facilities. In addition, VA uses the Barrier Free Design Standard to meet the needs of the Department of Veterans Affairs in its health care facilities.



2. BUILDING FEATURES

2.1 Types of Construction:

- A. For each construction type, design fire resistive ratings of structural members to meet the requirements in accordance with NFPA 220.
- B. Comply with the IBC Chapter 7 for protection of structural members except as noted below.
 1. Sprayed Fire-Resistant Materials.
 - a. Sprayed fire-resistant materials must be medium or high-density cementitious material or an intumescent coating material.
 - b. Mineral fiber or low-density cementitious materials are not permitted.

Note: VA does not permit the use of mineral fiber or low-density cementitious materials for fire proofing structural steel because these materials are easily knocked off the steel by routine activities.
 2. Provide UL-listed floor/ceiling and UL-listed roof/ceiling assemblies that do not require the underside of the roof or floor deck to have spray-applied fireproofing. The assembly must be designed so only columns, beams, and trusses receive spray-applied fireproofing to achieve the rating for the assembly.
 3. Listed floor/ceiling or roof/ceiling assemblies that utilize suspended gypsum wallboard or acoustical tile ceilings must not be used to achieve required fire resistance rating of building structural elements.
- C. Comply with the following:
 1. For buildings where NFPA 101 provides construction requirements for one or more of the occupancies within the building, the type of construction as well as the height for the building must comply with the most restrictive occupancy construction requirements of NFPA 101.
 2. For buildings where NFPA 101 does not provide construction requirements for any of the occupancies within the building, the construction type as well as height and area limitations for the building must comply with the requirements of the IBC.

Note: The height and area limitations found in the IBC will apply only to those buildings where all occupancies within the building have no construction requirements in NFPA 101. For example, use of the IBC will restrict the height and area of a Type V building containing a business occupancy while NFPA 101 would permit the building to be of unlimited height and area. Typically, new construction in the VA will require the building to be sprinkler protected and the limitations in the IBC for fully sprinkler protected buildings should not be overly restrictive.

2.2 Building Separation Distance:

- A. The requirements for fire resistance ratings of exterior walls, maximum area for exterior wall openings, and opening protection must comply with the IBC (see Note 1) except as follows:
 1. There are no requirements for separation or openings between VA buildings when both (all) buildings are fully sprinkler protected (see Notes 2 and 3). This exception does not apply to VA buildings that are adjacent to non-VA property lines.



2. As permitted under Section 2.9 of this design manual.

Note 1: Building separation requirements are found in Table 602 and opening requirements are found in Table 705.8 of the IBC. With greater than 60 feet of separation between buildings (or greater than 30 feet of separation between a building and a property line), there are no requirements in the IBC. With ≤ 60 feet of separation between buildings (or ≤ 30 feet of separation between a building and a property line) and where any one building is not fully sprinkler protected, the requirements in the IBC must be followed.

Note 2: Buildings that are sprinkler protected throughout are not considered to be an exposure hazard in accordance with NFPA 80A.

Note 3: If buildings touch each other, additional requirements might apply. For buildings of different construction types that are connected, NFPA 101, 8.2.1.3 requires the rating and classification of the structure to be the least fire-resistive construction type of the connected portions unless there is a 2-hour or greater vertically aligned fire barrier wall between the portions of the building in accordance with NFPA 221. In addition, NFPA 221, 7.3.1 does not permit windows in the two hour or greater rated fire barrier wall.

- B. Pedestrian walkways and tunnels must comply with the requirements of the IBC (Section 3104). However, the requirements in the IBC must not be used to reduce the occupancy separation fire barrier requirements of NFPA 101.

Note: While the IBC Section 3104 allows walkways and tunnels to connect structures without a fire rated barrier in some cases (sprinklers and glass), NFPA 101 has occupancy separation requirements that require fire rated barriers with corresponding opening protective requirements that must be maintained. Provide the fire ratings required by NFPA 101 where separated occupancies are required.

2.3 VA Hospital Building System (Interstitial): Fire protection requirements for facilities designed using the VA Hospital Building System (VAHBS) must comply with the following:

- A. Design the walk-on decks in accordance with the lightweight insulating concrete assembly tested and reported in NBSIR 85-3158 or NISTIR 5560, except that sprayed fire-resistive material protecting the bottom of purlins supporting walk-on decks must be sprayed to a minimum thickness of one-inch with fireproofing suitable for exposed applications. Wire mesh may be omitted from the bottom flange of the purlins supporting the deck.
- B. Columns, girders, and trusses within the interstitial space that support more than one floor and structural members in the mechanical room must have a minimum two-hour fire resistance rating (or greater if required by the construction type requirements for the building). Other structural members within the interstitial space are not required to be fireproofed.

Note: While the NIST test report stated, "there was no fire protection applied to the steel column where it was exposed to the interstitial space test environment," there was never any intent to allow columns to be without fire protection when supporting more than one floor. The VA Structural Advisory Committee also provided an opinion in the April 2013 minutes that fireproofing on columns in VA Hospital Building System designs should be continuous through the functional and interstitial space.

- C. Two-hour fire resistance rating is required between floors; the separation runs in a horizontal plane along the mechanical equipment room floor, then vertically along the wall separating the mechanical equipment room from functional spaces, then it continues along the interstitial deck



(an interstitial deck that is designed in accordance with paragraph A above is considered to provide a two-hour fire resistance rating based on the referenced NIST fire testing).

- D. The functional floor slab, except at the mechanical room service bay, is not required to have a fire rating, but all penetrations must be protected in accordance with NFPA 101.
- E. Within the interstitial space, a two-hour fire resistance rating is required for the enclosure of vertical openings (e.g., elevators, chases, stairs, etc.) that span four or more floors, and a one-hour fire resistance rating is required for the enclosure of vertical openings that span three or fewer floors. For the purposes of this paragraph, an interstitial deck as well as a functional floor are considered to be a floor.
- F. A one-hour fire resistance rating is required for the vertical wall separating the mechanical equipment room from the adjacent interstitial space.
- G. The interstitial space is not required to be subdivided horizontally into fire or smoke compartments. Horizontal exit walls and smoke barrier walls located below in functional spaces are not required to be extended up into interstitial spaces.
- H. Neither fire dampers nor smoke dampers are required where ducts penetrate the one-hour rated partition separating the mechanical room from the interstitial space.
- I. Fire dampers are required where ducts penetrate the two-hour fire rated partition separating the mechanical room from the functional space.
- J. For fully ducted systems, fire dampers are not required in ducts for openings in the interstitial deck less than 150,000 sq. mm (225 sq. in), including supply ducts from interstitial spaces to functional spaces, exhaust ducts, and return ducts from functional spaces into the interstitial space. Vertical ducts running through multiple stories must be protected in accordance with the requirements of NFPA 90A including protection within the interstitial space.
- K. Flexible duct work (UL 181, Class I) is permitted in interstitial space for connections less than 2.4 m (8 ft) long and must be no larger than 300 mm (12 in) diameter.
- L. Transfer openings are not permitted in the floor deck of the interstitial space. Air transfer between the functional space and the interstitial space is required to be by a system that is fully ducted within the interstitial space.
Note: The full scale fire tests conducted to qualify the use of the VAHBS involved HVAC systems that were fully ducted. The tests did not examine the use of HVAC systems that were open to both the functional space and the interstitial space.
- M. Smoke dampers are not required in ducts within the interstitial space that cross a smoke barrier in the functional space in buildings that are fully sprinkler protected. For ducts that cross a smoke barrier in the functional space, follow the smoke damper requirements within NFPA 101.
- N. Protect horizontal and vertical penetrations (ducts, cables, pipes, etc.) with through penetration protection systems.
- O. Provide fire alarm pull stations at exit doors from interstitial spaces and provide sufficient notification appliances so a fire alarm signal can be received throughout the interstitial spaces.
- P. Provide exit signs at exit doors and other locations to provide clear direction toward exits from interstitial spaces. Provide emergency lighting in interstitial spaces for adequate egress illumination in the event of a power outage.



Q. Sprinkler protection is not required within the interstitial space, except as specified below. Sprinkler protection is required for mechanical rooms.

- a. Sprinklers are required in electrical closets, signaling rooms, etc., located within interstitial spaces, and
- b. A single line of sprinklers is required above the tracks of electric track vehicle systems (ETVS) in interstitial spaces.

R. Elevator access is not permitted to the interstitial space.

Note: The interstitial space should be thought of as space within a fire-rated floor/ceiling assembly. The interstitial space is not provided with sprinkler protection and it is important to ensure that the space is not used for purposes for which it is not intended. The interstitial space is not intended to be normally occupied and access to the space is required to be limited. In addition, the deck of the interstitial space is not designed for the same use as the deck of a traditional mechanical area. If the interstitial deck were to become damaged, this could potentially compromise the 2-hour fire resistance of the floor/ceiling assembly.

S. Air handling units, mechanical equipment, and electrical equipment are restricted to the mechanical rooms and are not permitted within the interstitial space.

2.4 Interior Finish:

- A. Wall and ceiling finishes and movable partitions must conform to NFPA 101.
- B. Interior floor finish must conform to NFPA 101.

2.5 Site Considerations – Emergency Vehicle Access: Comply with VA Site Design Manual.

Note: The VA Physical Security and Resiliency Design Manual should also be consulted for additional requirements regarding access roads, standoff distances and control/vehicle barriers.

2.6 Insulation, including foam plastic: Comply with IBC. The IBC requirements for foam insulation applies to all building construction types.

Note: The requirements for foam insulation in NFPA 101 only apply to buildings that are required to be noncombustible (Type I or Type II). VA follows the requirements in the IBC that regulates foam insulation for all construction types.

2.7 Roof Coverings and Roof Deck Assemblies:

- A. Roof coverings must be approved or listed by a nationally recognized testing laboratory for compliance with UL standard 790 and must be Class B minimum.
- B. Roof deck assemblies must be FM Class I approved, or must be UL listed as Fire-Classified.

2.8 Roof Access: Comply with IBC.

2.9 Separation distance for shelters, pavilions, or similar structures located near, but not connected to, buildings containing health care (HC) occupancies or ambulatory health care (AHC) occupancies must comply with this section.

Note 1: This addresses shelters, pavilions, or similar structures near health care or ambulatory health care occupancies only. Where these types of structures are to be located near occupancies other than health care or ambulatory health care occupancies, refer to Section 2.2.



Note 2: For buildings of different construction types that are connected, NFPA 101, 8.2.1.3 requires the rating and classification of the structure to be the least fire-resistive construction type of the connected portions unless there is a 2-hour or greater vertically aligned fire barrier wall between the portions of the building in accordance with NFPA 221. NFPA 221, 7.3.1 does not permit windows in the two hour or greater rated fire barrier wall.

- A. For other than temporary construction office trailers or sheds (see 2.9 B below), locate shelters, gazebos, pavilions, or similar structures in accordance with Table 2.9A or Table 2.9B below:

Note: Table 2.9A and Table 2.9B are based on information obtained from NFPA 80A.

Table 2.9A: Minimum Separation Distance for Shelters, Pavilions, or Similar Structures of **Combustible** Construction

Are sprinklers provided in temporary structure	Opening protectives of exposed (HC or AHC) structure for openings within 25 feet from closest point of the temporary structure	Minimum distance from closest point of temporary structure to exposed building
Yes	Not applicable (protection not required)	0 feet *
No	No openings (blank wall)	0 feet *
No	Openings with 90-minute protectives	0 feet *
No	Openings with 60-minute protectives	10 feet
No	Openings with 45-minute protectives	15 feet
No	Openings with no protectives	25 feet

* See Note 2 above.

Table 2.9B: Minimum Separation Distance for Shelters, Pavilions, or Similar Structures of **Noncombustible** Construction

Are sprinklers provided in temporary structure	Opening protectives of exposed (HC or AHC) structure for openings within 25 feet from closest point of the temporary structure	Minimum distance from closest point of temporary structure to exposed building
Yes	Not applicable (protection not required)	0 feet *
No	No openings (blank wall)	0 feet *
No	Openings with 90-minute protectives	0 feet *
No	Openings with no protectives	10 feet

* See Note 2 above.

- B. Temporary Construction Trailers, Temporary Construction Storage Sheds, and Temporary Construction Dumpsters as identified in NFPA 241:

1. Locate temporary construction office trailers and sheds in accordance with NFPA 241. This will generally require 30 feet of separation unless sprinklers are provided. See NFPA 241 for details.



2. Construction dumpsters containing combustible material must be located 35 feet away from buildings of combustible construction or buildings with unprotected openings (windows), emptied after each work shift, or provided with a substantial metal top.

Note: For dumpsters that are not temporary construction dumpsters, see NFPA 1. VHA has had dumpster fires that have broken through windows that were not fire rated (protected).

C. Polycarbonate and aluminum (bus stop type) shelters:

1. Because it is difficult to ignite polycarbonate and aluminum (bus stop type) shelters and they are likely to collapse shortly after becoming fully involved in a fire, they are given special consideration. Polycarbonate and aluminum shelters located next to buildings with automatic sprinkler protection must be located 3 m (10 ft) or more from any unprotected openings. Such shelters located next to buildings without automatic sprinkler protection must be located 6 m (20 ft) or more from any unprotected openings.

2.10 Fire and Smoke Barriers: Fire and smoke barriers must be provided as required by NFPA 101. In accordance with PG-18-15, fire and smoke barriers must be shown on all drawings. Specifically indicate the hourly rating of every fire barrier. In accordance with NFPA 101(2021), 18.2.4.4.2, a door in a smoke barrier is not permitted to serve as the only exit access from a space in a smoke compartment.

Note: Corridor walls and smoke barriers including the doors within these walls, have different requirements. For instance, cross-corridor doors in smoke barriers are not required to latch, unlike corridor doors (or fire-rated doors). Do not provide latching hardware on cross corridor smoke barrier doors unless required for another purpose such as security.

Note: The VA considers 1-3/4-inch hollow metal doors to be substantial doors, which can be used in smoke barriers without the requirement for a 20-minute label in accordance with NFPA 101, 18/19.3.7.

2.11 Protection of Openings through Fire Barriers:

- A. Openings in fire rated barriers must be protected according to NFPA 101, 80, 90A, 91, and 96 or as otherwise required.
- B. Doors in such openings must be normally closed, unless they are permitted to be automatic closing in accordance with NFPA 101.
- C. Fire rating glazing, where used, must meet applicable safety standards.
- D. Fire shutters must be provided to protect openings in fire rated barriers designed to be normally open. Shutters must be designed to close upon activation of a smoke detector proximate to the shutter. Such detectors must close all shutters within a fire barrier served. Closing speed must be in accordance with NFPA 80.

Note: Shutters include rolling steel fire doors as well as service counter doors.

- E. Fire dampers must be installed in fire rated barriers in accordance with NFPA 90A. The location of all fire and smoke dampers must be shown on the drawings along with the location of the access panels to each of the fire and smoke dampers in accordance with NFPA 90A.
- F. Pharmacy Sterile Compounded Product (CSP), hazardous drug (HD) cleanroom primary engineering control and general room exhaust systems can remain on to maintain the clean room's state of control design requirements. Exhaust ducts from HD cleanrooms and HD primary engineering controls must comply with NFPA 90A or NFPA 91 where the exhaust ducts



must go through fire barriers. Both NFPA 90A and NFPA 91 provide options to go through fire barriers without installing fire dampers.

Note: In order to maintain continuous operation of the cleanroom ventilation system, the NFPA 90A allows the use of steel subducts at least 22 in. long to be located within a fire rated shaft to be used without a fire damper. NFPA 91 allows exhaust ducts to be wrapped with listed or approved materials having a fire resistance rating equal to the rating of the fire barrier a minimum of 10 feet distance on each side of the fire barrier including protecting the duct supports within the 10 foot span.

2.12 Suites: Corridor doors accessing suites in health care occupancies must latch except power operated doors as permitted in NFPA 101.

Note: The intent of this requirement is to ensure corridor doors accessing suites are equipped with latches just like other corridor doors. This would apply even if the suite doors were part of a smoke barrier, though this configuration is not advised. Often, operating room, ICU and recovery room suite doors are double leaf power operated automatic doors that do not normally latch. Beginning with the 2009 Edition of NFPA 101, these doors have not been required to latch provided there is 5lbf at the latch edge that will keep the door closed.

2.13 Exit Signs:

- A. Two exit signs are not required to be visible in an exit access corridor (see Healthcare Interpretations Task Force (HITF) 98-7).
- B. Exit signs with tritium are not permitted in VA facilities.

Note: Possession of tritium exit signs brings upon the facility legal responsibilities for compliance with Nuclear Regulatory Commission (NRC) regulations.

2.14 Door Locking Requirements: Doors are permitted to be locked in the direction of egress travel under conditions as identified in NFPA 101 (2021) as follows:

- A. Delayed-Egress Electrical Locking Systems (7.2.1.6.1) where permitted by the occupancy chapter.
- B. Sensor-Release of Electrical Locking Systems (7.2.1.6.2) where permitted by the occupancy chapter.

Note: This option allows the door to be unlocked upon approach of an occupant or during a fire alarm condition. Both conditions would allow entry into the secured area.

- C. Door Hardware Release of Electrically Locked Egress Door Assemblies. (7.2.1.6.3).
- D. Elevator Lobbies (7.2.1.6.4) where permitted by the occupancy chapter.
- E. For the safety of the patients in healthcare occupancies

- 1. Patient room doors (18/19.2.2.2.2)
- 2. Means of egress for the clinical needs of the patients (18/19.2.2.2.5.1)

Where the permission to lock doors in accordance with NFPA 101, 18/19.2.2.2.5.1 is used, NFPA 101, 18/19.2.2.2.6 requires the following:



Doors that are located in the means of egress and are permitted to be locked under other provisions of this chapter shall have provisions made for the rapid removal of occupants by means such as the follows:

Option A. Remote control of locks

Option B. Keying of all locks to keys carried by staff at all times

Option C. Other such reliable means available to the staff at all times.

VA Clarification for Options A, B, and C above:

For Option (A): The locked doors are required to be in the line of sight of the location of the remote operator.

For Option (B): Self evident

For Option (C): Card access security systems may be used provided that a mechanical key release is provided such that when the key is operated, it will directly interrupt the power to the locking mechanism independent of the card access system electronics and staff in the area carry keys at all times.

3. Means of egress where patient special needs require specialized protective measures (18/19.2.2.2.5.2)

Note: This locking permission was added in the 2009 edition of NFPA 101 especially for pediatric wards. Pediatric wards were being locked to prevent babies from being stolen and the locking was not truly for the clinical needs of the patients. The use of section 18/19.2.2.2.5.2 should rarely be used in the VA since the doors could be locked under the less stringent requirements for clinical reasons on 18/19.2.2.2.5.1.

Addition criteria from NFPA 101 as follows {(1) through (6) copied verbatim} is required to use this arrangement.

- (1) Staff can readily unlock doors at all times in accordance with 18/19.2.2.2.6.
- (2) A total (complete) smoke detection system is provided throughout the locked space in accordance with 9.6.2.9, or locked doors can be remotely unlocked at an approved, constantly attended location within the locked space.
- (3) The building is protected throughout by an approved, supervised automatic sprinkler system in accordance with 18.3.5.1 or 19.3.5.7.
- (4) The locks are electrical locks that fail safely so as to release upon loss of power to the device.
- (5) The locks release by independent activation of each of the following:
 - (a) Activation of the smoke detection system required by 18/19.2.2.2.5.2 (2)
 - (b) Waterflow in the automatic sprinkler system required by 18/19.2.2.2.5.2 (3)
- (6) Hardware for new electric lock installations is listed in accordance with UL 294, Access Control System Units.

Where the permission to lock doors in accordance with NFPA 101, 18/19.2.2.2.5.2 is used, NFPA 101, 18/19.2.2.2.6 requires the following:



Doors that are located in the means of egress and are permitted to be locked under other provisions of this chapter shall have provisions made for the rapid removal of occupants by means such as the follows:

Option A. Remote control of locks

Option B. Keying of all locks to keys carried by staff at all times

Option C. Other such reliable means available to the staff at all times.

VA Clarification for Options A, B, and C above:

For Option (A): The locked doors are required to be in the line of sight of the location of the remote operator.

For Option (B): Self evident

For Option (C): Card access security systems may be used provided that a mechanical key release is provided such that when the key is operated, it will directly interrupt the power to the locking mechanism independent of the card access system electronics and staff in the area carry keys at all times.

4) Doors in non-healthcare occupancies for the safety of patients (18/19.1.3.9.)

Note: From the NFPA 101 Handbook: Health care occupancy patients are sometimes moved to nonmedical areas — such as a chapel for religious services or an auditorium for recreation — that typically do not meet the provisions applicable to health care occupancies. Paragraph 18/19.1.3.9 permits such areas to be regulated by the provisions applicable to the corresponding occupancy (which would be an assembly occupancy in the case of chapels or auditoriums). Paragraph 18/19.1.3.9 addresses a subject similar to that addressed in 18/19.1.3.10 but adds the requirement that, where the clinical needs of the occupants necessitate the locking of doors, staff must be present for the supervised unlocking of doors and release of occupants. This additional requirement ensures that procedures are in place for the ready release of occupants.



3. SPECIAL PROTECTION

3.1 Storage:

- A. Storage rooms are considered hazardous areas and must comply with appropriate occupancy chapter requirements of NFPA 101.

Note: It is not the intent to require protection for storage rooms that is greater than the protection required by NFPA 101. A storage room may be classified as a hazardous area in one occupancy chapter and not be considered a hazardous area in another occupancy chapter.

- B. Rooms containing medical records storage or moveable-aisle/mobile shelving must be provided with automatic sprinkler protection and enclosed with a barrier having a one-hour fire resistance rating. Also see Section 6.1E.

3.2 Flammable and Combustible Liquid Storage:

- A. Comply with NFPA 30.
- B. Provide adequate space for flammable and combustible liquid storage cabinets.

3.3 Food Preparation Facilities:

- A. Provide fixed fire extinguishing systems for commercial cooking operations in accordance with NFPA 96 or as required by NFPA 101

Note: Some occupancies in NFPA 101 have provisions for using residential cooking equipment with unique protection requirements that differ from the protection requirements of NFPA 96.

- B. Activation of the fire extinguishing system must shut down the power/fuel source to the cooking equipment and the extinguishing system must be connected to the building fire alarm system.
- C. Fire extinguishing systems must be wet chemical type and must comply with UL300 in accordance with NFPA 17A.
- D. Where residential cooking stovetops are provided in occupancies where protection of the cooking equipment is not specifically addressed by NFPA 101, and the building is not sprinkler protected, residential wet chemical extinguishing systems must be provided to protect the stove top and actuation of the extinguishing system must shut down the power/fuel source to the cooking equipment protected by the system.

Note: This is not a system that is covered by NFPA 96, but it is a wet chemical system tested to UL 300A and it should shut down the fuel source.

3.4 Compressed Gas/Cryogenic Liquid Storage:

- A. Location, construction, and arrangement of compressed medical gas storage areas must comply with NFPA 99.
- B. Bulk oxygen supply systems or storage locations having a total capacity of more than 566 cu m (20,000 cu ft) of oxygen must comply with NFPA 55.
- C. Liquid oxygen storage tanks must not be located on or within 4.5 m (15 ft) of asphalt or bituminous pavement. Provide non-combustible joints and crack fillers around these tanks.

3.5 Laboratories:

- A. Laboratories using flammable or combustible liquids must comply with NFPA 45.



- B. Do not locate laboratories containing Class I flammable liquids in basements.

Note: Class I flammable liquids are not permitted to be stored in basements, per NFPA 30, 2018 edition, sections 9.3.5 and 9.7.3.

3.6 Casework (including non-moveable, built-in cabinetry, wardrobe, etc.):

- A. There are no restrictions in buildings provided with automatic sprinkler protection.
- B. NFPA 101, and NFPA 13 as of the 2013 edition, now require sprinklers to be installed in closets of nursing homes and new project designs are required to follow the referenced codes for sprinkler protection.

Note: VHA decided that sprinklers were not required in built-in wardrobes in the past (See IL 10A4-84-8, February 29, 1984). There is no requirement to retroactively install sprinklers in built-in wardrobes/casework of existing nursing homes (community living centers). See also the annex to NFPA 13 that exempts the requirement to sprinkler portable wardrobe units in nursing homes even where the wardrobe is mounted to a wall.

3.7 Telecommunications Spaces:

Note: For the purposes of this section, telecommunications spaces include as a minimum, Information Technology (IT) Data Centers as identified in Office of Information Technology (OIT), Infrastructure Standard for Telecommunications Spaces, V3.0 and Main Computer Rooms as identified in the VA Telecommunications and Special Systems Telecommunications Design Manual.

- A. Telecommunications spaces that support facilities or activities classified by the VA Physical Security and Resiliency Design Manual as mission critical (MC) or life-safety protected (LSP) with mission critical utilities/system redundancies must comply with the prescriptive requirements of NFPA 75.

Note: Requiring compliance with prescriptive requirements of NFPA 75 based on the classifications of facilities and activities identified in the VA Physical Security and Resiliency Design Manual is intended to satisfy the results of the fire risk assessment outlined in NFPA 75.

- B. Telecommunications spaces that support facilities or activities classified by the VA Physical Security and Resiliency Design Manual as mission critical (MC) or life safety protected (LSP) with mission critical utilities/system redundancies must be provided with wet pipe sprinkler protection utilizing standard response sprinklers with protective cages and must also be provided with a clean agent gaseous suppression system.

Note: Telecommunications spaces requiring a gaseous suppression system would generally include those with "Planned ANSI/TIA-942-B ratings" of 2 or 3 as identified in the OIT, Infrastructure Standard for Telecommunications Spaces, V3.0. Besides computer rooms/data centers with this classification, it also includes entrance rooms supporting computer rooms/data centers with a planned ANSI/TIA-942-B rating of 2 or 3 that are not separated from each other or from the computer room/data center. However, this does not apply to telecommunications rooms (TR) (also known by deprecated terms IT closet, switch room, IDF, etc.) which have a planned rating of 1 regardless of the rating of the supported computer room/data center.

Note: Standard response fusible link sprinklers will lessen the chance of a sprinkler being accidentally broken and will still provide structure protection since a standard response head is more robust and harder to break than a typical glass bulb quick response sprinkler.



- C. Telecommunications spaces that support facilities or activities classified as life-safety protected must be provided with wet pipe sprinkler protection utilizing standard response sprinklers with protective cages and smoke detection located to provide early warning of fire in accordance with NFPA 75 throughout the space and installed in accordance with NFPA 72.

Note: These telecommunications spaces would generally include those with a “Planned ANSI/TIA-942-B rating” of 1 as identified in the OIT, Infrastructure Standard for Telecommunications Spaces, V3.0.

Note: Telecommunications rooms (TRs) are not considered hazardous areas with respect to the requirements of NFPA 101. They are not required to be provided with fire protection such as fire rated walls, smoke detection, or a gaseous suppression system. In buildings that are sprinkler protected, these rooms will also be sprinkler protected.

- D. General Storage in Telecommunications Spaces. Paper stock, equipment packed in cardboard boxes, and other combustibles within telecommunications spaces must be restricted to the absolute minimum necessary for efficient operation. Any such materials in these spaces must be kept in totally enclosed metal file cases or cabinets.

- E. Fire Extinguishers.

1. For telecommunications spaces (excluding telecommunications rooms), clean agent fire extinguishers must be provided in accordance with NFPA 75 inside these spaces and located in a fire extinguisher cabinet.

Note: In accordance with the requirements of NFPA 75 and NFPA 10, the minimum rating for each required individual portable extinguisher should be 2A:10B:C and dry chemical extinguishers are not permitted.

2. For telecommunications rooms (TR), carbon dioxide or clean agent fire extinguishers must be provided no greater than 75 feet away from the IT space but must not be located within the telecommunications room.

Note: Telecommunications rooms are typically locked and are only accessible to IT personnel. Technicians responsible for inspecting fire extinguishers will have more ready access if the extinguishers are located outside the locked space.

- 3.8 Paint Spray Areas: Comply with NFPA 33.

3.9 Atrium Smoke Control Systems: Comply with NFPA 101 and NFPA 92. See the VA Design Manual for HVAC systems for additional design criteria.

3.10 VA Canteen Retail Stores: Retail stores located in health care occupancies must be considered as hazardous areas and must therefore be separated from adjacent spaces by one-hour fire rated construction.

3.11 Pharmacies: Pharmacies located in health care occupancies must be considered storage areas and must therefore be separated from adjacent spaces by one-hour fire rated construction. Fire or service counter shutters must be provided to protect openings where medication is dispensed, or other transactions occur.

Note: Pharmacies in health care occupancies are considered incidental to the predominant occupancy.



3.12 Chutes: Linen chutes and waste chutes must comply with the provisions in NFPA 82 for limited access gravity chutes.

3.13 Parking Garages: Parking garages must comply with the Special Provisions for Parking Structures in NFPA 101, Chapter 42 and NFPA 88A, except for construction type, height and area limitations, and building separation, which must comply with Sections 2.1 and 2.2 of this manual.

Note: NFPA 88A only addresses the construction type, height and area limitations for open parking garages and therefore VA defers to the requirements of the IBC for establishment of these limitations (detailed in Sections 2.1 and 2.2), for both enclosed and open garages. The IBC also addresses when an open parking garage is constructed above an enclosed parking garage.

3.14 Animal Research Facilities – Vivariums.

- A. Animal research facilities must comply with NFPA 150.
- B. The requirements of the IBC must be used where NFPA 150 references NFPA 5000.
- C. Animal research facilities must be sprinkler protected throughout by an electrically supervised automatic sprinkler system.
- D. Fire Alarm System:
 - 1. Animal research facilities must be provided with a private operating mode voice communication fire alarm system with speaker sound pressure levels may be reduced where required so that animals are not adversely affected.
 - 2. Strobes are required in accordance with Chapter 7 of this manual. However, strobes are not required in animal locations where the strobes would adversely affect the animals.
 - 3. Input from a representative the VA Office of Research must be documented by the architect/engineer of record in the design basis materials when required strobes are eliminated and/or when sound pressure levels are reduced in animal areas.
 - 4. Manual pull stations must be provided at each exit and such that the travel distance to the closest manual station does not exceed 200 feet.
 - 5. Emergency forces notification must be provided by any method permitted by Chapter 9 of NFPA 101. The connection must be permitted to go through the main campus fire alarm system and does not have to go directly from the research facility to the remote station.



4. OCCUPANCY CLASSIFICATION GUIDELINES

4.1 General: Occupancy classifications are defined in NFPA 101 and as follows:

Note: See also the “Decision Tool to Determine Occupancy” in Appendix D for help in occupancy determination.

Health Care Chapter 18	Ambulatory Health Care Chapter 20	Business Chapter 38	Residential Chapters 26, 28, 30 & 32	Industrial Chapter 40	Day Care Chapter 16
<ul style="list-style-type: none"> Hospitals Nursing Homes, Community Living Centers Mental Health and Behavioral Patient Care Units (psyche) Alcohol/Drug (4) Domiciliaries (6) 	<ul style="list-style-type: none"> Ambulatory Health Care Facilities (1) Emergency Department (ED) Urgent Care Clinic (UCC) Dialysis Center (2) 	<ul style="list-style-type: none"> Psychiatric Outpatient Clinics PACT Primary Care Clinic (PPCC) Alcohol/Drug Outpatient Facilities Methadone Maintenance Clinics Ambulatory Health Care Facilities (3) Administrative Offices Sleep Labs Dialysis Center (2) 	<ul style="list-style-type: none"> Blind Rehabilitation Alcohol/Drug (5) Domiciliaries (6) Quarters Buildings, Hoptels Homeless Shelters 	<ul style="list-style-type: none"> Research Buildings Laundry Facilities Power Plants Boiler Plants Engineering Shops 	<ul style="list-style-type: none"> Child Day Care Adult Day Care

- (1) Includes surgery centers, imaging centers and cardiac catheterization centers where four or more patients are rendered incapable of self-preservation without the assistance from others.
- (2) Dialysis centers can be ambulatory health care or business occupancy. Ideally and conservatively, design would be based on ambulatory health care occupancy requirements, but if the occupants and capable of self-preservation without staff assistance, they may be able to be classified as business occupancy.
- (3) A facility called an ambulatory health care facility that has occupants capable of self-preservation is actually a business occupancy
- (4) Medical detoxification facilities for Alcohol/Substance Abuse
- (5) Social detoxification facilities for Alcohol/Substance Abuse
- (6) Where staffing patterns do not meet health care requirements, Domiciliaries must be protected in accordance with the appropriate residential occupancy requirements.

Note: The appropriate VHA Handbook or VHA Directive should be used in addition to the above table to help determine the appropriate occupancy. Program names and facility types as identified in the Table are subject to change. For example, VHA has begun designating facilities as Health Care Centers (HCC). However, the HCC designation does not describe the services that are provided such that an occupancy can be determined.

Note: Effective July 2018, The Joint Commission (TJC) surveys residential facilities to the Residential Board and Care occupancy Chapter 32/33 of NFPA 101, 2012 edition. This is a change from past



practice where TJC Life Safety (LS) Standards were based on Chapter 26 Lodging or Rooming Houses and Chapters 28/29 Hotels and Dormitories. Even though TJC uses the 2012 edition of NFPA 101 at the date of this document update, design should be in compliance with the most current edition of NFPA 101 for domiciliaries in accordance with VA policy.

4.2 Multiple Occupancies: Buildings containing multiple occupancies must be considered mixed or separated as required by NFPA 101. Buildings containing occupancies that are not incidental to the primary occupancy must comply with the most restrictive requirement of the occupancies involved, unless separated by barriers having fire resistance ratings as required by NFPA 101.

Note: Hoptels are locations in which lodging accommodations, similar to a hotel, are provided. Determination of occupancy classification of Hoptels located in health care occupancies should be done on a floor or area basis when calculating occupant loads of sleeping residents. Requirements for corridor wall construction or sleeping room door closers should be evaluated in accordance with the following table. Hoptels within health care occupancies may be considered part of the health care occupancy provided staff is responsible for ensuring safe relocation and/or evacuation of residents.



Hoptels and NFPA 101

Number of Occupants Sleeping ¹	NFPA 101 – Occupancy Chapter	Construction Requirements	Corridor requirements	Rated Corridor Door	Closer Required	Latching Required	Smoke detection in corridor required?	Single Station Smoke Alarm Required? ²	Direct Connection to FD required?	Other ^{3, 4}
NA	Ch.19 ⁵ without sprinklers	Yes	1/2 hour	20-minute equivalent	No	Yes, or closing device to keep the door closed.	No	No	Yes	
NA	Ch. 19 ⁵ with sprinklers	Yes	Smoke resistant	20-minute equivalent	No	Yes, or closing device to keep the door closed.	No	No	Yes	
>16	Ch. 28 without sprinklers ⁶									
>16	Ch. 28 with sprinklers ⁶	None	1/2 hour ⁷	20 minutes ⁸	Yes	Yes	No	Yes	Yes	
≤16	Ch. 26 without sprinklers ⁹									
≤16	Ch. 26 with sprinklers	None	Smoke resistant	No	No	Yes, or closing device to keep the door closed.	No	Yes	No	
≤ 3	Ch. 24 ¹⁰ without sprinklers	None	None	No	No	No	No	Yes	No	
≤ 3	Ch. 24 with sprinklers	None	None	No	No	No	No	Yes	No	

¹ This should be addressed on an area basis (i.e., if there are multiple floors in a health care building, treat each zone/floor separately). This table assumes that the Hoptel is going into an existing health care occupancy. Where separate buildings are provided, they shall comply with the appropriate chapter in NFPA 101. See footnote 10.

² In guest rooms which have been specifically designed for the hearing impaired, a visible fire alarm signal shall be provided.

³ Signage including a floor plan shall be provided on the guest room doors to explain emergency egress for the floor/area. Fire safety information shall be provided to all residents to explain emergency egress actions.

⁴ All residents should be advised of the medical center smoking policy. For buildings with non-residential occupancies, the building fire plan must be revised to reflect that some of the occupants are residents sleeping overnight.

⁵ Health care chapters are provided for comparison purposes only.

⁶ New Hotels and Dormitories are required to be sprinklered throughout with QR heads (See NFPA 101, 28.3.5).

⁷ The corridor walls are required to extend from floor slab to floor slab, or, if the Hoptel is located within a sprinklered health care occupancy, the walls may terminate at a smoke resistant ceiling. Health care occupancies have minimum construction requirements as well as an automatic response from emergency forces that compensate for the wall not extending slab to slab.

⁸ Existing 1-3/4 inch solid bonded wood core doors are considered equivalent to 20 minute doors and are acceptable.

⁹ New Lodging and Rooming Homes are required to be sprinklered.

¹⁰ Chapter 24 shall not be used for Hoptels located within health care occupancies. As a minimum, the requirements in Chapter 26 shall be followed for Hoptel rooms located in health care occupancies.



5. WATER SUPPLY FOR FIRE PROTECTION

5.1 Adequacy of Water Supply: Assess adequacy of the existing water supply. Perform water supply flow testing of fire hydrants and/or fire pumps. If data is available from the facility, the designer must verify the locations involved in the testing as well as the quality and accuracy of the data.

Note: The water supply requirements originated from VA Circular 10-85-147, Water Supply for Fire Protection available on the HEFP intranet Web Site.

- A. Provide a secondary fire suppression water supply as required in the Physical Security and Resiliency Design Manual (PSRDM) for VA Facilities.

Note: The PSRDM covers Mission Critical Facilities and Life Safety Protected Facilities. Only the Mission Critical Facilities are required to have a secondary water supply for fire protection. However, the water storage volume might be required to be based on the demand for a Life Safety Protected facility.

- B. Design the secondary water supply to meet the largest expected fire demand (sprinkler system plus fire hose requirements) for the duration specified in paragraph 5.4. See also 5.2 below and the capacity requirement of the Physical Security and Resiliency Design Manual.
- C. Water storage tanks must be designed in accordance with NFPA 22 “Standard for Water Tanks for Private Fire Protection.”
- D. New water storage tanks must be provided with high- and low-level water switches that are connected to the site fire alarm system and initiate supervisory signals.

5.2 Capacity:

Note: Refer also to the Physical Security and Resiliency Design Manual for VA Facilities.

- A. Non-Sprinklered Buildings: Provide minimum fire flow as shown in Table 5.0. Partially-sprinklered buildings must be considered non-sprinklered. Typical building occupancies are shown for each NFPA 13 hazard classification. Flow demand depends primarily on the type of construction, occupancy, exposure to the building, access to the building site, and fire department response. Fires in non-sprinklered buildings require more water because application of water by fire department hose streams is less efficient and begins later than sprinklers. Use professional judgment to modify these requirements on a case-by-case basis depending on the following favorable and unfavorable conditions:

Note: It is recommended that any deviations be forwarded to the respective SFPE for review prior to incorporating the modification.

1. Favorable Conditions

- a. Non-combustible construction
- b. Limited exposures
- c. Ready access to entire building site by fire department apparatus
- d. Quick response (See NPFA 1710) by adequately staffed fire department

2. Unfavorable Conditions

- a. Combustible construction
- b. Moderate or serious exposures



- c. Hindrance to fire department apparatus access to building site
- d. Delayed response or inadequately staffed fire department

Table 5.0 – Minimum Fire Flows for New Non-Sprinklered Facilities and New Underground Water Systems (at 138 kPa (20 psi)).

NFPA 13 Hazard Classification	Favorable Conditions ⁽¹⁾	Unfavorable Conditions ⁽¹⁾
<u>Light Hazard</u> Patient Buildings, Offices, Quarters	79 L/s (1250 gpm) ⁽²⁾	95 L/s (1500 gpm)
<u>Ordinary Hazard</u> Laboratory Buildings, Shops, Laundries	79 L/s (1250 gpm) ⁽²⁾	126 L/s (2000 gpm)
<u>Extra Hazard</u> Warehouses	95 L/s (1500 gpm)	190 L/s (3000 gpm)

(1) See previous page for discussion of favorable and unfavorable conditions

(2) Based on the minimum required by NFPA 14 and fire department pumper capacities.

- B. Sprinklered Buildings: The required fire flows and pressures for buildings provided with automatic sprinkler protection must comply with NFPA 13 and other applicable NFPA standards. Also provide a minimum hose stream allowance for total combined inside and outside fire fighting to comply with NFPA 13.

5.3 Fire Pumps:

- A. When a fire pump is necessary to supplement fire flow and pressure, size it to comply with NFPA 13 and 14. Where hose is not installed or otherwise provided in the facility, the fire pump will be sized only for the sprinkler system requirements. The local responding fire department will provide the necessary flow and pressure for manual fire fighting operations. The capability of the fire department to handle the manual fire fighting requirements must be verified and documented.

Note: Standard operating procedures for most fire departments do not allow fire fighters to use occupant hose lines within buildings since the fire fighters are generally not aware of the condition of the hose, and use of the hose could potentially result in a dangerous situation. Fire department procedures also generally require fire fighters to connect a pumper truck to the fire department connection to augment the pressure to the sprinklers and standpipes. Hence it is the VA position that the building fire pump be sized only for the sprinkler system demand and to let the fire department supply the flow and pressure for manual fire fighting. The fire pump should be sized to handle manual fire fighting requirements in NFPA 14 only where the fire department pumper truck cannot provide the necessary pressure, and this is not anticipated at any VA facility. The designer must verify that the fire department can adequately supply the manual fire fighting requirements.

- B. Fire pumps must be designed and installed in accordance with NFPA 20. Separate fire pumps from all other areas of the building by fire resistant rated construction in accordance with NFPA 20. In new construction the fire pump must be in a separate room from other mechanical and electrical equipment.



- C. Design the fire pump piping arrangement to provide a test header, a flow meter, and a bypass, as detailed in Figure A.4.22.1.3(b) in Annex A of NFPA 20-2019. The test header is to be piped to an exterior straight type header that can be tested without damaging landscaping, etc. Provide a bypass with normally open valves. All fire pump system valves must be electrically supervised by tamper switches. However, padlocks and chains may be substituted in lieu of tamper switches for normally closed valves on a case by case basis.

Note: While Figure A.4.22.1.3(b) in Annex A of NFPA 20-2019 shows the bypass valves to be normally closed, these bypass valves should be open where the water supply to the pump provides pressure that would benefit the sprinkler and standpipe system.

- D. Pumps must start automatically at 69 kPa (10 psi) below jockey pump start pressure. Pumps must be manually shut down.

Note: Manual shut down of the fire pump will ensure that the pump does not shut down prematurely before controlling the fire. In addition, someone at the facility should go to the fire pump upon alarm to ensure that it is operating properly. NFPA 20 does not permit automatic shutdown where the fire pump constitutes the sole source of water for a sprinkler or standpipe system.

- E. Pumps must be electric motor driven, horizontal split case centrifugal type unless this is not feasible. Power transfer switch and fire pump controller must be factory assembled and packaged as a unit. Separate transfer switches are not permitted. Controller must be monitored by the fire alarm system.
- F. Provide electrical power to the fire pump, jockey pump and all related equipment. Electrical power must comply with NFPA 20 and NFPA 70.
- G. Provide jockey pumps to supply no less than 3.8 L/s (60 gpm) for the following:
1. Where a fire pump serves a high-rise building, or
 2. Where a fire pump serves a building with 24 or more waterflow switches, or
 3. Where a fire pump serves more than one building and those buildings together contain 24 waterflow switches or more.

This will allow the jockey pump to supply the flow equivalent of one sprinkler to permit waterflow switch testing and will permit tests to be performed without shutting down the fire pump. The jockey pump must maintain pressure as required to prevent the fire pump from operating to maintain system pressure.

Note: Assuming a pressure of 125 psi is maintained on a system, a 60 gpm jockey pump will provide enough water to handle the water flow testing of the flow switches without the need to shut down the fire pump. Some installations with fire pumps cannot test water flow switches without shutting down the fire pump due to hammering open dry pipe valves or discharging water onto roads or sidewalks during the winter seasons. A larger jockey pump for large systems with many waterflow switches ensures that the fire pump will be in service when needed. Follow manufacturers recommendations for sizing jockey pumps for smaller systems with less than 24 waterflow switches.

- H. Design electrical feeders to the fire pump to comply with NFPA 20 and NFPA 70. Feeders must be outside the building except in the fire pump room and electrical room of origin.



- I. Relief valves, where installed, must discharge to the atmosphere and must not be recirculated back to the suction side of the fire pump
- 5.4 Duration:
- A. Non-Sprinklered Buildings: Fire flows as required by Table 5.0 must be available for a duration of 60 minutes minimum for favorable conditions and 120 minutes minimum for unfavorable conditions (see Section 5.2).
 - B. Sprinklered Buildings: Fire flows must be available as required by NFPA 13 for the required occupancy classification. However, duration for health care occupancies must not be less than 60 minutes.
- 5.5 Distribution System:
- A. Installation must comply with NFPA 24.
 - B. Comply with the requirements in the VA Site Development Design Manual.
- 5.6 Hydrants:
- A. Installation must comply with NFPA 24.
 - B. Comply with the requirements in the VA Site Development Design Manual.
 - C. Contact the responding fire department for hydrant (thread) requirements.



6. FIRE EXTINGUISHING SYSTEMS

6.1 Sprinkler Systems:

- A. Automatic sprinkler systems must be installed for any of the following:
1. When required to meet the goals or objectives stated in the [Introduction](#) to this document including the following:
 - a. So that critical operational functions are not interrupted for longer than 24 hours; or
 - b. So that the loss of real or personal property does not exceed \$500,000.00.
 2. When required by [Section 1](#) of this document.
 3. When required by the Physical Security and Resiliency Design Manual.
- B. Installation must comply with NFPA 13, NFPA 13R, or NFPA 13D as applicable, except as indicated in 6.1.B through 6.1.R.
1. In NFPA 13 systems, sprinkler protection must be provided in all spaces including, but not limited to, elevator machine rooms*, walk-in freezers and cold rooms, computer rooms, telephone switch rooms, radiology and MRI shielded enclosures, loading docks, electrical rooms**, plumbing or utility closets, audiometric booths, vaults, paint spray booths, dry type lint collectors, dust collectors, and generator rooms. Exception: Sprinklers are not required where specifically exempted by NFPA 13, 13R, and 13D, and as specified in paragraphs 6.1.B.2 and 6.1.B.3 below:

**Note on elevator machine rooms: See [6.1 M](#) and [7.4 H](#) that may allow the omission of sprinklers.*

***Note on electrical rooms: While NFPA 13 allows the omission of sprinkler protection in electrical rooms within buildings under specific conditions, the VA does not permit the use of this exception. The VA requires sprinkler protection using standard response fusible link sprinklers in all electrical rooms except stand-alone buildings dedicated to electrical service where applicable FM data sheets are followed.*
 2. For sprinkler requirements in VAHBS interstitial spaces, see section 2.3.
 3. New audiometric booths installed in a sprinkler protected building must be protected with sprinklers since they are occupiable spaces within a sprinkler protected building. Existing audiometric booths without sprinkler protection may be permitted to be kept in service without sprinkler protection provided the booths are constructed and listed with a one-hour fire rating and are equipped with 45-minute self- or automatic- closing doors.

Note: Field experience has shown that self-closing audiometric booth doors frequently do not operate properly so that the doors do not close completely. Where it is unlikely that the doors can be made to operate properly, sprinkler protection should be provided.
 4. CPVC piping must not be used in the VA for new construction. Facilities with existing installations using CPVC piping should consider replacing the piping with black steel before experiencing failure of the CPVC piping. VA has experience numerous failures of CPVC piping.

Note: Numerous chemicals typically found in commercial construction are known to be incompatible with, and detrimental to, CPVC pipe and fittings. Some chemicals have been



shown to be the cause of failure of the CPVC piping. The continuous effort required to police all of the chemicals that may affect the CPVC piping for the life of the installed system makes this piping material a bad choice for use in the VA.

Note: Fire and smoke barrier penetrations need to be sealed and the known compatibility issues with fire barrier sealants would make CPVC use an unwise choice where fire and smoke barriers are required in the facility. See the documents included at the end of this document and at the links below.

- [CPVC Chemical Compatibility](#)
- [Potential Damage to CPVC Fire Sprinkler Systems From Spray Foam Insulation](#)
- [Potential Damage to CPVC Fire Sprinkler Systems From Connection to Anti-Bacterial Corrosion Lined Metal Piping](#)
- [FlameGuard Jobsite Notice](#)
- [FlameGuard Turnover Notice](#)

5. Flexible sprinkler hose that is FM Approved is permitted as identified in the VA specification section.
- C. Provide wet pipe sprinkler systems, unless installed in areas subject to freezing. Dry pendant or dry sidewall sprinklers, dry pipe, or antifreeze systems may be used in areas subject to freezing. Propylene glycol must be used if antifreeze systems need to be installed. Do not use pre-action type systems.

Note: NFPA 25 requires dry sprinklers to be removed and tested every 10 years due to the extremely high failure rates of these types of sprinklers. They are not recommended.

Note: Consult the requirements of NFPA 13 before designing a new antifreeze system. As of August 2020, there was one UL Listed antifreeze solution available on the market that would be permitted by NFPA 13 and it can only be used in temperatures as low as -10°F (-23.3°C).

Note: Dry pipe systems should use a supervisory nitrogen system with black steel pipe as identified in the VA guide specification. A supervisory air system can be substituted for the supervisory nitrogen system where system conditions, such as area/assets protected and system replacement costs, warrant it.

- D. Sprinkler systems must be hydraulically calculated by any design approach allowed by NFPA 13, except that the Special Design Approaches identified by NFPA 13 must be used only when specifically permitted by NFPA 101. Pipe schedule systems may be used for extension of existing pipe schedule systems where water supply is adequate. Sprinkler systems must be designed based on available water supply without the fire pump operating, where possible. A safety factor must be included by calculating the demand to a point no greater than 10% below the available water supply curve. Or, a ten percent safety factor must be provided (subtract 10% from the available water supply curve) for each sprinkler demand including the required hose streams.
- E. Sprinkler densities must comply with NFPA 13.
- F. Delineate on the drawings special conditions such as storage racks/shelving location, height and configuration (including mobile shelving); atria; open ceilings, or architecturally sensitive areas; audiometric booths; walk-in freezers and cold rooms; computer rooms and raised flooring; loading docks and exterior canopies; residential sleeping etc. which may have an impact on sprinkler design and installation.



- G. Coordinate with the facility and show smoke zone boundaries, hazard classification, density, and other special requirements on drawings. Sprinkler zones must coincide with all smoke zone boundaries within health care occupancies and other occupancies that are required to be subdivided by smoke barriers.

Note: Since the sprinkler contractor is required by NFPA 13 to hydraulically calculate the system and provide working drawings, this effort should not be duplicated by the A/E. Some items commonly not identified on the drawings that create problems are drain terminations, hazard classification, smoke zone boundaries, and water supply hydraulic information. The contractor needs to know where to start, what the available water supply is, the commodities being protected, what area is supplied by each flow switch, and special circumstances such as areas subject to freezing and combustible concealed spaces.

- H. Rooms containing bulk supply storage must be classified as required by NFPA 13. If provided by the contract, storage racks must utilize open shelving systems. Ensure shelving which obstructs sprinkler water from penetrating down through racks is not used.
- I. Provide seismic protection in accordance with [VA Seismic Design Requirements](#) H-18-8.
- J. Install quick response sprinklers (QRS) in all areas, except where specifically prohibited or noted elsewhere in this document (e.g., telecommunications spaces, electrical switchgear rooms, elevator shafts, pharmacy compounded sterile product (CSP) clean rooms, or elevator machine rooms). On retrofit projects, replace existing standard response sprinklers with QRS within the smoke compartments being modified.

Note: While it is not permissible to mix standard and quick response sprinkler heads within a compartment as defined in NFPA 13, it might be permissible on a case by case basis to install standard response sprinklers in spaces within smoke zones that are protected by quick response sprinklers, such as in the examples noted above. (It is generally not permissible to mix standard and quick response sprinkler heads within a compartment as defined in NFPA 13). The risk of an accidental discharge due to physical damage of the sprinkler is lessened with the installation of standard response sprinklers since they generally have operating elements that are more massive than the operating elements of quick response sprinklers. The advantage gained in response time by installing quick response sprinklers would not be worth the increased risk due to possible accidental discharge of a QR sprinkler. (It is easier to break a quick response glass bulb head by striking it from the side than it is to break a standard response glass bulb head).

- K. Sprinklers to be installed in VA facilities are required to be Factory Mutual (FM) approved as quick response except as identified below. At the present time, concealed sprinklers are not permitted to be used for new construction in VA facilities because there are none that have passed the FM test for quick response (see Exceptions 2, 3, and 5). On retrofit projects, replace existing standard response sprinklers with QRS within the smoke compartments being modified.

Note: Factory Mutual test requirements are different than Underwriters Laboratories Inc. (UL) test requirements. One example of this is the test for quick response concealed sprinklers. At the present time, there are no concealed sprinklers that have passed the FM test for quick response. Even those that are UL listed quick response concealed sprinklers have not passed the FM quick response test.

Note: The VA recognizes the need for concealed sprinklers in some cases and will allow concealed sprinklers that are UL Listed quick response and FM Approved standard response in those cases (see Exceptions 2, 3, and 5). However, manufacturers do not permit concealed heads



to be used in negative pressure rooms, as identified in the manufacturer's written installation instructions. Concealed heads are limited by each of the manufacturers to those rooms that are neutral pressure or positive pressure relative to the pressure above the ceiling. Therefore, concealed heads cannot be used in those spaces that are designed as negative pressure without voiding the listing of the sprinkler. There was a fire in a VHA facility where the leaking duct work above the ceiling prevented concealed heads from operating. Even though the room was not designed as negative pressure, the room was negative relative to the plenum space above and the sprinkler did not operate. See photos below.



Note: Another reason that VA does not generally permit the use of concealed sprinklers is that VA requires many rooms in healthcare facilities to be designed as negative pressure rooms and it would be very difficult to ensure that concealed sprinklers would not be installed in these locations since the room pressure relationships are typically not readily known to the sprinkler designer.

Exception 1. "Institutional" type sprinklers in accordance with Paragraph (L) below.

Exception 2. For pharmacy compounded sterile product (CSP) clean rooms, concealed sprinklers that are UL listed as quick response and FM approved as standard response are permitted provided that the rooms are not designed under negative relative pressure. Where pharmacy CSP clean rooms are designed as neutral or positive pressure rooms relative to the space above the room ceiling, concealed sprinklers may be used. However, pharmacy CSP clean rooms for hazardous drugs preparations must be designed to be negative pressure relative to adjacent spaces, including the ceiling plenum space above the room; therefore, concealed sprinkler heads are not permitted in these Pharmacy CSP hazardous drug clean rooms.

Note: Do not use concealed "sealing" sprinklers. Concealed "sealing" sprinklers use a gasket around the ceiling plate of the sprinkler to seal the small gap formed between the sprinkler ceiling plate and the ceiling tile. These sprinklers are not FM Approved and are not permitted, since the seal around the ceiling plate of the sprinkler will further delay sprinkler operation. In existing installations where concealed "sealing" sprinklers are found, replace these sprinklers.

Exception 3. In special instances, concealed sprinklers that are UL Listed quick response and FM approved standard response may be used with the approval of the VHA Central Office Fire Protection Engineer. Requests for approval should be made through the VA Project Engineer.

Note: Examples of special instances where non-FM approved concealed sprinklers might be appropriate include closets or audiometric booths with low ceilings. Where movable equipment is mounted on rails at the ceiling level, FM approved quick response sidewall sprinklers should be used and not concealed sprinklers.



Exception 4: FM Approved standard response sprinklers are permitted where quick response sprinklers are prohibited. (e.g., elevator shafts or elevator machine rooms.)

Exception 5: UL Listed non-ferrous (concealed or non-concealed) sprinklers for use inside MRI shielded enclosures.

Note: As of August 2019, the only non-ferrous quick response sprinklers available for use in MRI enclosures are UL Listed, concealed type.

Exception 6: Standard response sprinklers are required to be installed in telecommunications spaces with an ANSI/TIA-942-B planned rating of 2 or 3 and entrance rooms supporting computer rooms/data centers with a planned ANSI/TIA-942-B rating of 2 or 3 as identified in 3.7. Standard response sprinklers are permitted to be installed in telecommunications rooms (TRs) and other spaces with a planned rating of 1.

- L. Install “institutional” type quick response sprinklers in psychiatric areas (Mental Health and Behavioral Patient Care Units) where sheet rock or plaster ceilings are required by PG-18-14, Room Finishes, Door and Hardware Schedule. Installation of “institutional” sprinklers in psychiatric areas with lay-in acoustical tile ceilings may be appropriate where constant supervision by staff is not provided. Consult facility for locations and for additional requirements. Show these areas on drawings.

Note: For additional requirements concerning mental health facilities, consult with the facility patient safety manager or suicide prevention coordinator and obtain a copy of the VHA Mental Health Environment of Care Checklist (MHEOCC).

Note: The issue of where to place “institutional” sprinkler heads should be taken to the facility safety committee/patient safety/risk management group. Staff supervision of the patients, other institutional building features, and clinical diagnoses will all play a part in whether “institutional” type sprinklers are required.

Note: There are no standardized tests that are used to qualify a sprinkler as an “institutional” type sprinkler. “Institutional” is a marketing term used by the manufacturers of the sprinklers. At the present time, there are no FM approved sprinklers that are marketed as “institutional” type. At the time of design, it is recommended that the market be surveyed and that the sprinkler model with the most favorable characteristics be specified. The following features are typically characteristic of an “institutional” sprinkler:

- *Tamper resistant construction including a tamper-resistant escutcheon to reduce the possibility of the escutcheon being removed and used as a weapon.*
- *Components designed to break away to reduce the possibility of being used as an anchor for hanging. (Tyco Raven [Pendent and Sidewall] 35lbs per Tyco Technical Services), Tyco TFP MAX [Pendent & Sidewall] 80lbs dynamic load, Viking VK410 [Pendent] 30lbs at 6 inches, Viking VK412 [Sidewall] 40lbs at 6 inches, Reliable XL INST [Pendent and Sidewall] 50lbs at 1 inch). {Information above is for institutional sprinklers as of 8/20/2020}.*

Note: While institutional fire sprinklers may be designed to break at pre-determined static or dynamic loads, it is possible for compression of the jugular or carotid arteries to occur with as little as 4 pounds causing death. Therefore, it is very important that fire sprinklers and their appurtenances not provide any element that could serve as an anchor point for a lanyard or ligature.



- *Installation instructions and sprinkler components designed to reduce the possibility of the escutcheon being used as an anchor for hanging. One design approach involves a retaining collar that is attached to the sprinkler pipe with set screws. This design is intended to prevent the escutcheon from being pulled away from the ceiling surface. This design would not be appropriate where the ceiling surface is a lay-in ceiling. A lay-in ceiling allows access to numerous anchor points by the removal of or punching through a tile. Another design approach involves an escutcheon installed with spacers. This design is also intended to prevent the escutcheon from being pulled away from the ceiling surface. This approach may be compromised if there is deflection in the sprinkler piping such that the escutcheon can be pulled away from the ceiling surface. If this approach is to be used, plastic pipe should not be permitted (plastic pipe is not permitted for new VA facilities) and a hanger should be installed at each sprinkler drop to prevent pipe deflection.*

M. Sprinklers and Elevators: Sprinklers are required to be installed in accordance with NFPA 13. See also Section [7.4](#).

1. Sprinklers are permitted to be omitted from elevator machine rooms, elevator machinery spaces, control spaces, and hoistways of passenger or service traction elevators where permitted by NFPA 13 where the elevator machine room is **dedicated to elevator equipment in accordance with ASME A17.1**. This provision does not permit materials unrelated to elevator equipment to be stored in elevator machine rooms, machinery spaces, control rooms, control spaces, or hoistways of traction elevators.

Note: The terms elevator machine rooms, elevator machinery spaces, control spaces, and hoistways are defined in NFPA 70 and ASME A17.1. Controls that were typically located in an elevator machine room may be located in any of the spaces mentioned. The VA Elevator Design Manual requires the use of machine rooms for VA facilities.

Note: New facilities should be constructed in accordance with ASME A17.1, which would require the elevator machine room to be dedicated to elevator equipment allowing the omission of sprinklers in accordance with NFPA 13. However, many existing VA facilities have been designed where elevator equipment is located in a room or space that is not dedicated to elevator equipment. Where the elevator equipment room is not dedicated to elevator equipment, the provision in NFPA 13 that allow sprinklers to be omitted is not permitted to be utilized.

2. Where passenger or service elevator hoistways are noncombustible or limited-combustible construction and the elevator car enclosure materials meet the requirements of ASME A17.1 and the suspension cables of traction elevators are noncombustible, do not install sprinklers at the top of elevator hoistways in accordance with NFPA 13.
3. Where sprinklers are required to be installed for elevators, install standard response sprinklers with intermediate temperature rating 93°C (200°F) or higher in elevator shafts, elevator pits, and elevator machine rooms. Install sprinklers in elevator hoistways and pits only when required by NFPA 13. (Note: See Section [7.4 H](#) for necessary power shutdown requirements when sprinklers are installed.)
4. Do not install sprinklers in elevator pits except as required in Section [7.4 H](#).

N. Do not use flow control (on/off) sprinklers.



- O. Where buildings are required to be sub-divided into smoke compartments, segregate sprinklers into zones that correspond to the smoke compartments. Coordinate sprinkler zones with smoke (compartments) and fire alarm evacuation zones. Provide a flow switch, isolation valve, tamper switch, and pressure gage for each zone. Provide separate zones for paint spray booths, dust collectors, and lint collectors.

Note: Valves should be readily accessible (such as in stairways) so that the valve can be readily operated to prevent water damage in case of accidental pipe failure. Valves should not be located above ceilings or behind locked doors. However, in some circumstances such as within a locked psychiatric unit, it may be necessary to locate valves behind locked doors.

- P. Route the drain pipes for each sprinkler riser and test connection to the building exterior to facilitate testing. Do not terminate at service sinks as those drains are typically inadequate for flow testing. Drain piping must be 50 mm (2 in) minimum to accommodate discharge from full flow tests at maximum system pressure. Design exterior drains to prevent flooding or damage to landscaping, and to prevent wetting of walkways.
- Q. Specify non-ferrous piping and sprinklers for all areas within Magnetic Resonance Imaging (MRI) shielded enclosures.

Note: For sprinklers, see [Exception 5](#) to Section 6.1K.

- R. Determine and identify on drawings the location of fire pump, risers, all valves, fire department connections, drains, and points of connection with underground fire service main.
- S. Protection of Emergency Systems: Where NFPA 70, Article 700 permits emergency systems and circuits to be installed in spaces or areas that are fully protected by an approved automatic fire protection system, the spaces or areas are considered fully protected where the sprinklers are installed in accordance with NFPA 13.

Note: For example, where emergency circuits are located above a lay-in ceiling, sprinkler protection would not be required to be installed above a lay-in ceiling where the space above the lay-in ceiling is a noncombustible concealed space and sprinkler protection is provided throughout the building in accordance with NFPA 13.

Note: See NFPA 70(2020), 700.10(D)(2)(1), 700.10(D3), and 700.12(B).

6.2 Standpipes and Fire Hose Connections:

- A. Standpipes must be installed in all buildings where required by NFPA 101, NFPA 45, or NFPA 1, except as modified by the following paragraphs.
- B. Install Class I hose connections per NFPA 14.
- C. Manual wet standpipes are preferred.
- D. Flow and pressure requirements must comply with NFPA 14 except as modified in Section [5.3](#), Fire Pumps.

Note: If the facility is a high-rise building, defined by NFPA 14 as a building where the floor of an occupiable story is greater than 75 ft (23 m) above the lowest level of fire department vehicle access, an automatic standpipe system is required by NFPA 14. It is the position of the VA that a manual wet standpipe system should be provided and that the building fire pump should be sized only for the sprinkler system demand with the understanding that the local responding fire department will supply the flow and pressure for manual fire fighting. If the local responding fire



department pumper truck cannot provide the necessary flow and pressure, then an automatic wet standpipe system supplied by a properly sized fire pump would be required (this is not anticipated at any VA facility). The designer must verify that the local responding fire department can adequately supply the manual fire fighting requirements.

- E. For seismic requirements, refer to Section 6.1.I.

6.3 Gaseous Extinguishing Systems (Clean Agent, Carbon Dioxide, etc.):

Note: Until the 7th Edition of the VA Fire Protection Design Manual, VA did not specify the use of gaseous fire extinguishing systems. NFPA 75 was modified in 2003 to require protection of the underfloor spaces within information technology (IT) rooms.

Note: The use of clean agent extinguishing systems in spaces other than those spaces that require protection in accordance with NFPA 75 are not permitted without permission from a VHA Central Office Fire Protection Engineer.

- A. Provide clean agent gaseous extinguishing systems when spaces are required to be protected in accordance with NFPA 75. Clean agent extinguishing systems when provided, are in addition to automatic wet pipe sprinkler systems and not in lieu of sprinkler systems.

Note: A master specification for clean agent extinguishing systems has been published on the VA Technical Information Library that will allow three clean agents to be used as required for the project: FM200 (HFC-227ea) (Halocarbon), Inergen (IG-541) (Inert Gas), and Novec 1230 (FK-5-1-12) (Halocarbon).

Note: Selection of these agents was based on research performed by Rolf Jensen & Associates, Inc. that addressed various characteristics of clean agents including, but not limited to, design criteria, environmental impact, personnel safety, and availability of the clean agent. For a summary of selected characteristics of fire extinguishing clean agents used in determining which clean agents would be permitted in the specification, see the [Summary of Selected Characteristics of Fire Extinguishing Clean Agents](#).

*Note: The concentrations on the summary are based on protecting Class C (energized electrical) hazards. NFPA 2001, 5.4.2.4 would require design concentrations using a safety factor of 1.35 x the minimum extinguishing concentration (MEC) for heptane. The MEC for heptane is provided in the annex of NFPA 2001. (FM200: $1.35 * 6.7 = 9\%$; Inergen: $1.35 * 31 = 41.9\%$; Novec 1230: $1.35 * 4.5 = 6.1\%$)*

- B. Where a gaseous fire extinguishing system is provided only under a raised floor, NFPA 75 requires the gaseous system to be either carbon dioxide or an inert gas. However, VA does not permit the use of carbon dioxide.

Note: While NFPA 75 permits sprinkler and carbon dioxide systems to protect underfloor spaces, VA has determined that sprinklers are generally not appropriate due to the height of a typical underfloor space and carbon dioxide is also not appropriate since it is an asphyxiant and most IT spaces will routinely be occupied.

- C. Where a gaseous fire extinguishing system is provided throughout the IT space, including under the raised floor if provided, clean agents other than inert gases can be used.



6.4 Portable Fire Extinguisher Cabinets:

Note: While fire extinguishers might be required by NFPA 101, the option of using cabinets is the responsibility of the design team. Section 6.4 applies only if cabinets are used.

- A. Locate fire extinguisher cabinets to comply with NFPA 10. Locate additional fire extinguisher cabinets in the surgical suite, high value IT (Information Technology) equipment and telephone switch rooms (See 3.7(F)), and in elevator machine rooms. Do not provide fire extinguishers as part of the construction project unless specifically requested by the facility.

Note: Most of the time, extinguishers will be located in corridors. Where located in corridors, they should be installed in recessed cabinets to maintain the clear width of the corridor and to avoid projections into the corridor. Where extinguishers are located in spaces other than corridors, recessed cabinets may not provide any additional benefit.

- B. Size fire extinguisher cabinets to accommodate the largest of the commonly used extinguishers, a 9.5 L (2-1/2 gallon) pressurized water extinguisher. Recessed cabinets are preferred. Specify conspicuous marking of recessed cabinets.

Note: The minimum dimensions of a cabinet that will house a 2-1/2 gallon extinguisher would be approximately 27" (H) x 12" (D) x 8" (W). It is the intent that cabinets, where provided, are sized for the 2-1/2 gallon extinguisher even when a smaller fire extinguisher may be provided. Most clinical environments require multiclass extinguishers (ABC extinguishers), rather than Class A extinguishers such as the pressurized water extinguishers alone. However, if a smaller cabinet is installed, this might limit future options for the facility to provide alternate types of extinguishers that require a larger cabinet.

- C. When cabinets are installed in corridors, interrupt installed handrails for the installation of the cabinets or install the cabinets below the handrails so that the top of a 9.5 L (2-1/2 gallon) pressurized water extinguisher, noted in 6.4 B above, which is typically 24.5 inches tall, is located no more than 5 feet above the finished floor.

6.5 Extinguishing Systems for cooking facilities/equipment: Provide wet chemical fire extinguishing systems in accordance with UL 300 and NFPA 17A. See Section [3.3](#). Dry chemical systems must not be installed.



7. FIRE ALARM SYSTEMS Fire alarm systems must be installed in buildings when required by this section.

7.1 Purpose:

- A. The primary purpose of a fire alarm system is to notify the appropriate people and initiate the proper response from those people who are notified.
- B. The secondary purpose is to initiate fire safety functions, which are building and fire control functions that are intended to increase the level of safety for occupants or to control the spread of the harmful effects of fire.
- C. The fire alarm system operation must be coordinated with the facility fire plan.

Note: This does not preclude the facility from modifying the fire plan to meet the fire alarm system operation. New fire alarm systems may, and often will, require the existing facility fire plans to be updated.

7.2 General Requirements:

- A. The fire alarm system must be installed where required by NFPA 101 and must be designed to meet the requirements contained in NFPA 72 and this manual.

Note: For healthcare occupancies, the power circuit to the fire alarm control unit (FACU) is required by NFPA 70 to be connected to the life safety branch of the essential electrical system. In addition, NFPA 72 requires the circuit breaker feeding the FACU to have a red marking.

- B. For the purposes of this manual, VA facilities will fall into one of the following three categories:

Note: The proper categorization of a building or an area of a building will help to identify the type of notification required as well as the correct placement of notification appliances as indicated later in this section.

1. Health Care including Ambulatory Health Care (except as described below.)
2. High Rise, non-Health Care
3. Other, (including Ambulatory Health Care as described in the note below.)

Note: Very small free standing Ambulatory Health Care occupancies are permitted by NFPA 101 to be constructed without more than one smoke compartment. In that case, the facility would fall under 7.2.B.3 ("Other"), since 7.3.F.2.(a) requires the alarm in the zone of origin to be a temporal three alarm signal (general evacuation).

Note: See Section [3.14](#) for Animal Research facilities - Vivariums.

Note: See Section 2 for Interstitial Spaces (VA HBS).

- C. Do not combine fire alarm systems with other systems such as building automation, energy management, security, etc. Down time for any of these non-life safety systems will also take the fire alarm system out of service. This is not acceptable to the VA.
- D. All fire alarm wiring must be installed in raceway separate from all other systems.

Note: The intent of installing fire alarm wiring in raceway is to allow for possible future modifications of the system that might require adding (or removing) conductors in the raceway, which is the reason a minimum ¾ inch conduit size is specified for fire alarm systems on VA projects. For the purposes of this requirement, raceway does not include the use of armored



(Type AC) cable or metal clad (Type MC) cable. While nonmetallic communication raceway might be used, it would not meet the survivability requirements that may be required by NFPA 72 and as indicated in item E and F below.

- E. Where survivability is required for systems employing relocation or partial evacuation, wiring installed in **metal** raceway within buildings that are protected throughout by sprinklers are considered to meet the NFPA 72 requirements for Pathway Survivability as a 2-hour performance alternative that has been approved by the authority having jurisdiction and is permitted for voice communication systems in VA facilities.
- F. Where survivability is required and where fire emergency voice/alarm control equipment, metal junction boxes, terminal cabinets, and power supplies are located in a building sprinkler protected throughout in accordance with NFPA 13, and where the control equipment is also protected in accordance with NFPA 72, 10.4.5, they are considered protected by other equivalent means to provide a 2-hour fire resistance rating approved by the authority having jurisdiction meeting the requirement of NFPA 72(2019), 24.4.8.6.6 (3).

Note: NFPA 72 could be interpreted such that fire alarm equipment that effects more than one smoke zone is required to be installed within 2-hour fire rated enclosures. The above provides an equivalent means for protecting the equipment approved by the VHA AHJ. Fire alarm control equipment would also be required to be provided with smoke detection or located in a space that is continuously occupied in accordance with NFPA 72, 10.4.5.

- G. Wiring for local building fire alarm systems must be specified as defined in NFPA 72 as follows:

Initiating Device Circuits (IDC): Class B.

Signaling Line Circuits (SLC): Class B.

Notification Appliance Circuits (NAC): Class B.

Communications between building fire alarm control units: Class X.

Note: Class B signaling line circuits (these are not initiating device circuits by definition) are preferable for local building fire alarm systems because it permits the circuits to be t-tapped and the allowable length of the circuits are not shortened. No clear advantage is seen for running Class A circuits except where signaling line circuits are run between building fire alarm control units. Where signaling line circuits are run between fire alarm control units in separate buildings, fiber optic circuits are preferred because they are not susceptible to damage from lightning strikes. Where Class X copper circuits are installed, provide isolation modules that will ensure that only one building is lost (will not respond) during any type of fault. Although desirable, it is not required that Class X circuits be run in separate conduits from each other.

- H. Analog addressable systems are encouraged where many smoke detectors are required to be installed. These systems do not require the frequent sensitivity testing for smoke detectors that the hard-wired systems require and the savings in testing will pay for the extra cost of the system.

7.3 Typical Operation:

- A. Table 7.3 is provided to identify the typical operation required by the respective fire alarm systems. A table similar to this should be added to the contract documents to indicate the specific operation required of the system.





Table 7.3 Fire Alarm System Input Output Matrix

*While NFPA 101 does not require some detectors to notify building occupants, VA requires all smoke detectors, other than duct smoke detectors, to notify building occupants. Only install smoke detectors when required by NFPA 101 or its references.

** Those doors that are required to be tied to the fire alarm system such as delayed egress electrical locking systems and sensor release electrical locking systems.

*** This applies to Ambulatory Health Care Occupancies that require smoke barriers per NFPA 101 or are designed with multiple smoke zones.

INPUT DEVICE ↓	OUTPUT →										
	1. Sound general building alarm for Other and Non-High Rise (non-Health Care). See Section 7.2.1	2. Notify necessary staff for response for Health Care, Ambulatory Health Care***, and High Rise buildings only (alarm signal may be different on different floors).	3. Notify Fire Department.	4. Initiate supervisory signal to a 24-hour manned point for immediate response.	5. Close associated smoke barrier doors on the floor.	6. Close dampers on fan proximate to detector.	7. Shut down air handler served by the detector.	8. Recall elevator.	9. Initiate elevator shut down and disconnect elevator power.	10. Open **locked egress doors on floor of fire origin.	11. Disconnect fuel source from cooking equipment.
Duct Smoke Detector*	X ^B	X ^B	X ^B	X ^B		X	X ^A				
Area Smoke Detector*	X	X	X							X	
Door Release Smoke Detector*	X	X	X		X	X				X	
Elevator Smoke Detector*	X	X	X					X			
Manual Pull Station	X	X	X		X					X	
Elevator Machine Room Heat Detector	X	X	X						X		
Generator Room Heat Detector	X	X	X							X	
Sprinkler Waterflow / Pressure Switch	X	X	X		X					X	
Water Control Valve Tamper				X							
Fire Pump (Any alarm condition required by NFPA 20)				X							
High/Low Pressure Dry-Pipe Sprinkler System				X							
Kitchen Hood Suppression System	X	X	X		X					X	X
Gas Extinguishing Systems	X	X	X		X					X	
Dry-Pipe Valve Room Temperature Alarm				X							
Dedicated Fire Water Storage Tank Low Level				X							
Dedicated Fire Water Storage Tank Low Temperature				X							

A – Do not provide duct detectors in dedicated (100%) exhaust fans, they should continue to run.

B – The facility is permitted to sound the general alarm/notify necessary staff or initiate a supervisory signal to be consistent with the operation of existing systems/fire plan.



- B. Notification of staff for response must be by digital voice (speaker) systems unless not warranted by existing conditions (e.g., small extensions to an existing coded system). For new systems, do not use coded or taped voice systems. Where speakers are installed as the notification appliance, the fire alarm system must be designed such that it is possible to manually broadcast an emergency voice message simultaneously to all buildings provided with speakers. Selectable switches must also be provided at the fire alarm voice control panel so that a manual voice message can be communicated to each connected building individually. As a minimum, provide one switch per building. Additional switches (e.g., one switch per floor or zone) are optional.
- C. Coordinate fire alarm zones with smoke compartments and sprinkler zones (See Section 6.1.O).
- D. Provide initiating devices in accordance with NFPA 101, NFPA 72, and provide additional manual pull stations adjacent to the nurse's stations in health care occupancies. At least one manual pull station must be provided within each fire or smoke zone of a healthcare or ambulatory healthcare occupancy that is designed for defend in place.

Note 1: It is recommended that an unlocked manual pull station be located at the nurse's station within a locked patient care unit so that a fire can be quickly reported. With the new security systems in place, keys that were once carried by staff at all times to unlock doors are no longer being carried. They are often carrying swipe cards instead.

Note 2: Manual pull stations are generally not required within exit stairs. They generally should be installed at the door leading into an exit stair.

- E. Provide institutional style (key to operate or locking covers) pull stations in psychiatric areas. Provide covers on pull stations in child care centers to prevent children from initiating unwanted alarms. Coordinate with the facility.
- F. Notification Appliances: Placement and spacing of notification appliances must be in accordance with NFPA 72 and must be selected based on the purpose of the notification (i.e., general evacuation or staff response) as follows:
 - 1. **General Evacuation** (See output 1 of Table 7.3): Where general evacuation is required, the audible signal must conform to ANSI S3.41, Audible Emergency Evacuation Signal (i.e., temporal three pattern).

Note: These requirements are based on the building or area of the building being evacuated upon alarm. Many areas in a health care setting should be designed as general evacuation areas since there will be few or no trained staff to direct traffic. For example, cafeterias, basements, and administration sections could be considered to be general evacuation areas. For small stand-alone buildings, systems using bells or horns should be provided unless communication from the main hospital building using a voice system is desired. See the discussion under Section 7.3.F.2, Staff Response.

- a. Provide audible notification appliances to be heard in all locations throughout the protected premises (building).
- b. Provide visible notification appliances in all public accessible areas of the building such as corridors, auditoriums, cafeterias, open assembly rooms ≥ 750 ft², canteens, retail stores, etc. Exception: Visible notification appliances are not required in the following spaces which are not considered to be public accessible:



- 1) Individual office spaces unless the space is known to have a hearing-impaired person stationed there.
- 2) Closets (janitor's, clothes, etc.)
- 3) Utility shafts.
- 4) Crawl spaces.
- 5) Normally unoccupied rooms ≤ 100 ft².
- 6) Normally unoccupied storage spaces where no regular activities take place other than placement and retrieval of storage.
- 7) Stairway enclosures and elevators.
- 8) Patient exam/treatment rooms.

Note: Though the U. S. Access Board has rendered an opinion that requires strobes in examination and treatment rooms, the VA modifies this recommendation and does not require strobes in examination and treatment rooms since patients will only be in these rooms with permission of the staff. This is in line with the last paragraph of Technical Bulletin # 2 included at end of this document and at the following link.

<https://www.cfm.va.gov/til/dManual/ADAAGBull2VisualAlarms.pdf>

2. Staff response (See output 2 of Table 7.3):

Note: These requirements are intended for the defend-in-place requirements of the health care and ambulatory health care occupancies where staff need to know what is happening so they can give direction to those who need it. Patients are considered to be in need of help for evacuation and evacuation itself will only be undertaken as a last effort.

Fire Alarm System Operation for Health Care and Ambulatory Health Care Occupancies – Background:

What is required? How does VA meet the requirements? Why do it this way? Other Issues, General Requirements.

What is required?

NFPA 101 states, "For health care and ambulatory health care occupancies, the proper protection of patients shall require the prompt and effective response of health care and ambulatory health care personnel." It goes on to say, "The basic response required of staff shall include the following:

- (1) Removal of all occupants directly involved with the fire emergency*
- (2) Transmission of an appropriate fire alarm signal to warn other building occupants and summon staff*
- (3) Confinement of the effects of the fire by closing doors to isolate the fire area*
- (4) Relocation of patients as detailed in the fire safety plan."*

The fire alarm system in a health care and ambulatory health care occupancy should immediately notify the staff in the zone of alarm origin to take action (e.g., "RACE") and



simultaneously summon adequate staff remote from the zone of alarm origin to respond to assist staff in the zone of alarm origin.

How does VA meet the requirements?

The VA takes the following approach for implementing the requirements of the code for health care and ambulatory health care occupancies:

- a. Upon operation of a fire alarm initiating device, the fire alarm system will, **in the zone of alarm origin only**,
 - 1) Notify staff/occupants by activating a temporal three alarm signal and
 - 2) Activate the visible appliances (strobes).
- b. Simultaneously the fire alarm system will send a voice message to the rest of the building and other buildings as necessary to notify enough staff to respond to the zone of alarm origin. No visible appliances will be activated outside of the zone of alarm origin.

Note: For health care and most ambulatory health care occupancies, VHA uses the private operating mode as permitted in NFPA 101 and defined in NFPA 72. The public operating mode is only used for those occupancies where the intent is to evacuate the building.

Note: For health care and ambulatory health care occupancies, an adequate number, as a minimum, is considered to be one staff member for each two nonambulatory patients within a smoke zone in buildings that are not fully sprinklered, and one staff member for each four nonambulatory patients for fully sprinklered buildings. Nonambulatory patients are considered to be those who are incapable of taking action for self-preservation under emergency conditions without assistance from others. Nonambulatory patients include behaviorally impaired patients. For further guidance, see VHA Directive 7717, Planning for Fire Response.

- c. Subsequent activations of initiating devices in the same zone of alarm origin will not initiate any new alarm outputs but will appear at the fire alarm control unit and printer. Subsequent to the original alarm, activation of initiating devices in a different zone will initiate the temporal three signal and visible appliances in the new zone and will initiate a new voice message to the locations as determined above, to identify the new location of alarm.

Note: It is anticipated that personnel will respond and take control of the system before too many initiating devices are activated.

- d. The temporal three signal is to be designed to the private operating mode requirements contained in NFPA 72.

Note: This should be interpreted to mean that the sound pressure level is not so loud that staff cannot communicate during the alarm, but loud enough to hear that an alarm is sounded in the zone. The speakers do not have to meet the sound pressure levels for public operating mode identified in NFPA 72. There may be some parts of the building where the speakers would be tapped to meet the public mode sound pressure levels where the intent is to have occupants evacuate in that section of the building. Occupant notification requirements should be carefully reviewed during the design, taking into account the



training (or lack of training) of staff and activities that are expected to take place in the space.

Clinic spaces can often be addressed the same as in-patient ward spaces since staff will have the same level of fire safety training and the clinic operations are very similar to that which would be found in a typical in-patient ward with the exception that the hours of operation may be only during normal business hours.

Attached warehouses, shops, and mechanical penthouses are areas where the sound pressure levels may need to be designed for public operating mode, especially if routine events occur during which there are no trained staff to respond and direct occupants.

- e. The strobes are to be installed as outlined below and synchronized if necessary, within the zone in accordance with NFPA 72. Both audible and visible signals are to be programmed to continue to operate for five minutes or until the system is acknowledged and turned off/silenced by an operator. The strobes are only to be activated in the zone of alarm origin and not in the zones where the voice message is used.

Note: This will allow staff to be trained to take action as if the fire is in their zone when they see the strobes or hear the temporal three signal.

Generally, the voice message is sent only to the remainder of the building in which the alarm occurs. However, in some cases, the message must be sent to additional buildings to summon sufficient numbers of staff to help relocate patients.

- f. The voice message is to be preceded by a tone alert. No less than three rounds of a voice message to bring staff to the zone of alarm origin is required to be announced.

For Example: (tone alert) "Code Red, First Floor Center, Code Red, First Floor Center, Code Red, First Floor Center." The message content is to be coordinated with the local VA Medical Center Staff.

- g. Manual operation of the voice system will override all automatic voice messages in the system.

Why do it this way?

The operation provided above will elicit a more rapid response from staff in the zone of alarm origin since this is the only location where visible strobes and the temporal three signal are activated. The strobes and temporal three signals require no interpretation and staff can immediately respond. In older coded systems and in voice systems, the occupants/staff must take time to interpret what the code is or what the voice message says before carrying out their defined duties in a fire event.

Since most health care buildings in the VA are actually mixed occupancies, the arrangement above works well for those buildings that contain mixed occupancies. If the alarm originates in an area (this could be an entire floor) of a health care building that is a business occupancy or equivalent, the alarm system would generate a temporal three signal and activate the visible appliances throughout the area. This would be the proper signal for untrained occupants to evacuate. If there are staff in the area, they will be trained to take appropriate action for the signal received.



Other Issues

- h. To help ensure that the alarm is initiated in the zone of alarm origin, smoke detectors that are installed to hold open smoke barrier doors at smoke zone barriers must be installed on both sides even though NFPA 72 allows, in some cases, a detector to be installed on one side only. Detectors must then be programmed for their respective zone to initiate the proper alarm as well as to close the door served.

Note: It should be noted, and it is recognized, that there is always a possibility that the smoke from a fire would set off a detector in an adjacent zone first, or a staff member may activate a manual box in an adjacent zone.

There are other systems that can be utilized to help summon staff during a fire alarm activation. These include paging and radio systems. In some instances, it may be beneficial to tie the fire alarm system outputs to summon staff by way of these systems.

- i. While fire alarm voice communication systems are not permitted to be used as general paging systems, they may be used for emergency communications other than fire emergencies where the operators are trained in the use of the system.

General Requirements

- j. Provide speakers to be heard in all locations throughout the protected premises from where staff must respond. This may include more than one building if the number of staff within a building is not adequate. For health care, nursing ward areas should be utilized for responders since areas other than nursing wards (e.g., administration areas) will generally be occupied only during normal business hours.
- k. Speakers must be installed and arranged so they are clearly heard and understood by staff under normal working conditions. A rule of thumb for speaker layout is to install them every twenty-five to thirty feet on center and not to expect them to be clearly heard through more than one wall.

Note: The SFPE Handbook of Fire Protection Engineering provides guidance on the placement of audible notification appliances.

- 1) Do not locate audible notification appliances within surgical operating rooms. However, ensure that the temporal three signal can be heard within all surgical operating rooms.
 - 2) Provide subdued audible notification appliances in critical care areas.
- l. Provide visible notification appliances in the following areas:

Note 1: In general, notification appliances should not be installed exterior to a building unless absolutely necessary.

Note 2: Strobes are activated only in the zone of alarm origin. Strobes in areas outside of the zone of alarm origin provide no help to staff to identify the location to which they are to respond. Strobes are to be located to assist staff to react immediately without having to interpret the signal. That is, if staff see that the strobes are activated then staff know that they are within the zone of alarm origin.

- 1) Spaces subject to noise, such as mechanical equipment rooms, where the message delivered by the audible appliance might not be heard or might be unintelligible.



- 2) Audiometric booths (not required if the light from the appliance can be seen from within the booth.)
- 3) Public restrooms.
- 4) Public accessible areas of the building such as corridors, auditoriums, cafeterias, open assembly rooms ≥ 750 ft², canteens, retail stores, etc. Exception: Visible notification appliances are not required in the following spaces which are not considered to be public accessible (See also NFPA 99.):
 - a) Individual office spaces unless the space is known to have a hearing-impaired person stationed there.
 - b) Closets (janitor's, clothes, etc.)
 - c) Utility shafts.
 - d) Crawl spaces.
 - e) Normally unoccupied rooms ≤ 100 ft².
 - f) Normally unoccupied storage spaces where no regular activities take place other than placement and retrieval of storage.
 - g) Stairway enclosures and elevators.
 - h) Patient sleeping rooms and adjoining patient bathrooms.
 - i) Patient exam/treatment rooms.

Note: Though the U. S. Access Board has rendered an opinion that requires strobes in examination and treatment rooms, the VA modifies this recommendation and does not require strobes in examination and treatment rooms since patients will only be in these rooms with permission of the staff. This is in line with the last paragraph of Technical Bulletin # 2 included at end of this document and at the following link.

<https://www.cfm.va.gov/ti/dManual/ADAAGBull2VisualAlarms.pdf>

- 5) Do not provide visible notification appliances inside critical care areas, surgical operating rooms, or patient sleeping rooms.
 - 6) Do not provide visible notification appliances in any health care and ambulatory health care occupancy where their presence would interfere with patient treatment (such as psychiatric areas). Consult with the facility.
- G. Flash rate must not exceed one flash per second (1 Hz) for visible appliances. Strobes that operate on adjacent zones on each floor must be synchronized with one another as required by NFPA 72.
- H. Provide fire department notification by any of the allowed methods identified in NFPA 72. Where direct connections to the fire department are permitted by the fire department, they are acceptable as long as the circuit is supervised for grounds, shorts, and opens.

Note: The four types of connections identified in NFPA 101 are auxiliary, central station, proprietary, or remote station. When there is a VA fire department on site that receives the signal, it is generally considered to be a proprietary system. The typical VA loop system is connected to the fire department via an auxiliary connection (masterbox) or a positive non-



interfering and succession (PNIS) module in the control panel. A proprietary system requires the VA fire department or other VA forces to respond to all signals, alarm, supervisory, and trouble. Some may have a direct connection to a non-VA fire department, but these connections are not normally installed in accordance with any requirements contained NFPA 72. Central station has its own niche and that is for highly protected risk (HPR) facilities. The VA, in most instances, connects via a Digital Alarm Communication Transmitter (DACT) to a listed central station for monitoring purposes only. This is a remote station service as defined in the code. A telephone operator's phone call to the fire department is not sufficient (however, per VA policy, a phone call from the telephone operator is required in addition to one of the four types of connections).

- I. All building fire alarm systems having outputs in column 2 of Table 7.3 must be designed, at a minimum, to be capable of performing the output functions specified in columns 1, and 4 through 11 when communications outside of the building are lost.

Note: As a minimum, buildings will stand alone as a general evacuation alarm system when communications are lost to other networked buildings. Some designs require a signal from a remote building to operate properly. Where that communication is lost, the building should default as indicated to provide a general evacuation signal.

- J. Fire fighter telephones: Where required by NFPA 101 and where hand-held radios are ineffective for communication by emergency personnel within a building, two-way telephone communication service must be provided in accordance with NFPA 101 and NFPA 72. A telephone jack must be provided at the fire pump in addition to the telephone jack locations identified in the codes.

7.4 Special Requirements:

- A. Locate the main fire alarm panel at the front entrance or at a 24-hour location coordinated with the facility. This will allow the fire department to utilize the panel as an annunciator where no occupants are present.

Note: Care should be taken when determining which locations are staffed on a 24-hour basis. For example, locations such as the VA Police office or VA Fire Department station house might not be staffed continually.

- B. Provide space for fire alarm terminal cabinets (if required) and conduit risers. Provide fire alarm panels in electrical rooms and mechanical rooms where possible.
- C. In accordance with NFPA 72 and 101, provide smoke alarms in domiciliary resident sleeping rooms, family/staff quarters, on-call staff sleeping rooms, hoptel sleeping rooms, and other sleeping rooms in non-patient areas. ABAAS and ADA require a minimum of 1 unit, and 1 out of each 25 rooms in each occupancy category, to be provided with visible appliances (strobe lights) activated by the smoke alarm. Facilities are encouraged to provide additional visible notification appliances (combination smoke detector/visible notification appliance) up to 100%, where possible. See NFPA 72 for light intensity and mounting instructions. See NFPA 101 for the requirements for low frequency alarms.

Note 1. Planning for visible notification appliance installations should consider that the facility will only be able to assign hearing-impaired persons to those rooms where visible notifications are provided. Installing strobes in more rooms will allow greater flexibility to the facility when assigning rooms to hearing-impaired people.



Note 2. In every room which contains a smoke-alarm-activated strobe light in a building with a fire alarm system, the room must also contain a strobe light that is activated by the building fire alarm system.

- D. Smoke detectors are to be installed only where required by the National Fire Codes, this design manual, or where required by an equivalency.
1. All smoke detectors must be photoelectric type only.
 2. Alarm verification must not be used for smoke detectors installed for the purpose of early warning.
 3. Nurses' stations that are not staffed 24/7 in healthcare occupancy are considered spaces that are open to the corridor and require smoke detection in accordance with NFPA 101.
 4. Where NFPA 101 requires smoke detection in nursing homes (Community Living Centers), install smoke detection in corridors and not in patient bedrooms. This will eliminate the need for two smoke detectors at each smoke barrier door (see [7.3\(F\)2\(4\)h](#)) since the corridor smoke detectors on each side of the smoke barrier doors will serve the same purpose.

Note: Smoke detectors are not required in electrical rooms. Smoke detectors might be required to protect fire alarm equipment in an electrical room when the fire alarm equipment requires protection in accordance with NFPA 72. In this case, a smoke detector is only required at the location of the equipment in accordance with NFPA 72.

- E. Heat detectors are not required unless used in conjunction with elevator shutdown, where used as a substitute for smoke detectors in environments unsuitable for smoke detectors, or where used to protect emergency generators that are not equipped with automatic sprinklers. Exception: Heat detectors are not required in small remote buildings that house emergency generators. Provide heat detectors in all generator rooms in non-sprinklered buildings. The heat detector must be fixed temperature, extra high temperature (325-375 °F) rating. It is anticipated that most generator rooms will be sprinkler protected and will not require heat detectors.
- F. Indicate the capacity of all air-handling units. Duct smoke detectors are to be installed only where required by NFPA 101 or NFPA 90A. Where duct a smoke detector is located above a ceiling or in a difficult to reach location, provide a remote indicating lamp and a test key switch on nearby wall at 7 ft AFF to facilitate testing.
- G. When an annunciator is required, it must be located at the building entrances where the fire fighters will respond. The main control panel can act as an annunciator. Coordinate the location with the local fire department. Circuits from the fire alarm control panel to a remote annunciator must be supervised.
- H. Elevators: Elevator fire protection must comply with the requirements of NFPA 13, NFPA 70, NFPA 72, NFPA 101, and ASME A17.1 or A17.3 as applicable. See also Section [6.1 M](#).

Note: The VA Elevator Design Manual requires the use of elevator machine rooms. Even though there are machine room less (MRL) elevators and some are being used, criteria in this manual are based on elevators installations with machine rooms.

Note: The VA Elevator Design Manual references the IBC for elevator requirements. The



requirement for hoistway venting was deleted from the IBC in the 2015 edition and there is no requirement to interface a hoistway vent with hoistway smoke detection.

Note: Designers are reminded of the requirement in Chapter 9 of NFPA 101 for independent ventilation or air conditioning systems to maintain proper temperature during elevator fire fighters service operation for elevator machine rooms that contain solid-state equipment for elevators having a travel distance of more than 50 feet above the level of exit discharge or more than 30 feet below the level of exit discharge, and the requirement that when standby power is connected to the elevator, the machine room ventilation or air conditioning must be connected to standby power.

Note: Elevators have been an ongoing fire protection problem, not only for the VA, but also for the entire industry. Many conflicting requirements seem to exist at any given time. Although other methods are permitted in the NFPA 72 for power shut down when sprinkler protection is present, the VA uses the heat detector option as identified in the NFPA 72 and as clarified below.

Table 7.4 - Elevator Protection Requirements Summary

Elevator Type	Sprinklers			Smoke Det.			Heat Det. See *		
	Machine Room	Top of Hoistway	Hoistway Pit	Machine Room	Top of Hoistway	Hoistway Pit	Machine Room	Top of Hoistway	Hoistway Pit
Note: For each elevator type (Traction/Hydraulic), review each condition identified below the type of elevator and provide the proper protection as identified for each condition. Protection for each condition is additive.									
Traction Passenger or Service Elevator Baseline: (See Notes A and E)				•					
Elevator machine room NOT dedicated to elevator equipment (See Note E)	•			•			•		
Elevator car material NOT compliant with ASME A17.1 (See Note F)		•		•	•			•	
Suspension cable combustible (See Note G)		•	•	•	•			•	
Traction Freight Elevator Baseline: (See Note B)		•		•	•			•	
Elevator machine room NOT dedicated to elevator equipment (See Note E)	•	•		•	•		•	•	
Suspension cable combustible (See Note G)		•	•	•	•			•	
Hydraulic Passenger or Service Elevator Baseline: (See Note C)	•		•	•		•	•		
Elevator car material NOT compliant with ASME A17.1 (See Note F)	•	•	•	•	•	•	•	•	
Hydraulic Freight Elevator Baseline: (See Note D)	•	•	•	•	•	•	•	•	

Notes for Table 7.4:

* Where heat detection is required, heat detectors are to be installed within 2 feet of each sprinkler in the space.

(A) All traction passenger and service elevator in a sprinkler protected building will require smoke detection in the machine room as a base requirement and assumes that the elevator car material is compliant with ASME A17.1,



suspension cables are non-combustible, and the elevator machine room is dedicated to elevator equipment.

(B) All traction freight elevators in a sprinkler protected building will require sprinklers at the top of the hoistway, smoke detection in the machine room and at the top of the hoistway, and heat detectors within 2 feet of the sprinklers in the hoistway as a base requirement and assumes that suspension cables are non-combustible and the elevator machine room is dedicated to elevator equipment.

(C) All hydraulic passenger and service elevators will require sprinklers in the machine room and in the pit where combustible hydraulic fluid is used, smoke detection in the machine room and in the pit, and heat detectors within 2 feet of the sprinklers in the machine room. as a base requirement. Heat detectors are not required near the sprinklers in the pit unless the sprinklers could cause unsafe elevator operation in accordance with ASME A17.1 2.8.3.3.2 (i.e., where there is control equipment in the hoistway pit that would be affected by the sprinkler operation.) Heat detectors are required in the pit where control equipment in the pit would be adversely affected by the sprinkler operation.

(D) All hydraulic freight elevators will require sprinklers in the machine room, top of the hoistway, and in the pit, smoke detection in the machine room, top of the hoistway, and in the pit, and heat detectors within 2 feet of the sprinklers in the machine room. Heat detectors are not required near the sprinklers in the pit unless the sprinklers could cause unsafe elevator operation in accordance with ASME A17.1 2.8.3.3.2 (i.e., where there is control equipment in the hoistway that would be affected by the sprinkler operation.) Heat detectors are required at the top of the hoistway to shunt power as sprinkler operation could adversely affect elevator operation by wetting controls in on to and inside the elevator cab. Heat detectors are required in the pit where control equipment in the pit would be adversely affected by the sprinkler operation.

(E) See NFPA 13, 9.3.6.3 (2019 Ed) – Using this exemption will still allow a building to be considered fully sprinkler protected in accordance NFPA 101 even though the elevator machine room is not sprinkler protected.

(F) See NFPA 13, 9.3.6.6 (2019 Ed). Heat detectors are not required near the sprinklers in the pit unless the sprinklers could cause unsafe elevator operation in accordance with ASME A17.1 2.8.3.3.2 (i.e., where there is control equipment in the hoistway that would be affected by the sprinkler operation.) Heat detectors are required at the top of the hoistway to shunt power as sprinkler operation could adversely affect elevator operation by wetting controls in on to and inside the elevator cab. Heat detectors are required in the pit where control equipment in the pit would be adversely affected by the sprinkler operation.

(G) See NFPA 13, 9.3.6.7 (2019 Ed).

1. Provide smoke detection for Phase I Emergency Recall Operation for new elevators. Provide smoke detection for Phase I Emergency Recall Operation for existing elevators that have a travel distance of 25 feet or more above or below the level of fire department response.

Note: The requirements for Phase I Emergency Recall Operation do not apply when the hoistway, or portion thereof, is not required to be fire-resistive construction, the travel does not exceed 6 ft 8 in, and the hoistway does not penetrate a floor (ASME A17.1).

- a. Provide smoke detectors in the elevator lobbies, in elevator machine rooms, elevator pits of hydraulic elevators, and elevator machine and control spaces to initiate Phase I Emergency Recall Operation. Provide smoke detectors at the top of the elevator hoistway or in the pit of hydraulic elevators to initiate Phase I Emergency Recall Operation only when sprinklers are installed at the top of the hoistway or in the pit of a hydraulic elevator. See Table 7.4.

Note: The requirement to initiate Phase I Emergency Recall Operation by a fire detection device (smoke detector) in the pit due to a sprinkler installed in the pit was established by a change to the 2013 edition of NFPA 72.



Note: NFPA 72 requires that detection devices installed inside a hoistway be accessible from outside the hoistway. When devices are required to be installed inside the hoistway, the A/E must detail how detection devices are to be installed allowing access from outside the hoistway.

Note: In larger rooms that contain other mechanical equipment, smoke detectors are required only above the elevator machine room equipment. Some rooms have a lot of space that is not dedicated to elevator equipment and smoke detection would not be required for that space.

- b. Provide three supervised control circuits from the fire alarm system to a point within three feet of the elevator controller for the purpose of providing an interface with the elevator system. When actuated, the three circuits will, respectively provide the following:
 - (1) designated level associated output
 - (2) alternate level associated output
 - (3) elevator machine room, elevator machinery space, elevator control space, or elevator control room associated output
2. Where sprinklers are installed in elevator machine rooms, elevator hoistways, or elevator pits, provide heat detection in accordance with Table 7-4 to remove power from the elevator prior to water discharge from these sprinklers.

Note: Passenger and service elevator cars that were built to the requirements of the ANSI code since 1985 have a flame spread no greater than 75 and a smoke developed rating no greater than 450 (Class B, per ASTM E 84 / NFPA 255). Where the elevator cars meet these requirements and the suspension cable is noncombustible, NFPA 13 allows sprinklers to be omitted from the top of the hoistway. When sprinklers are omitted from the top of the hoistway, NFPA 72 does not require, nor does it permit, a smoke detector to be installed at the top of the hoistway due to the difficulty experienced with performing testing and maintenance.

- a. Elevator main line power shutdown (commonly known as “shunt trip”): Power to the elevator must be removed prior to or immediately upon release of water from a sprinkler in the elevator machine room (including machine space, control room, or control space) or hoistway including the pit of hydraulic elevators. Operation of a heat detector used to initiate shunt trip must cause the shunt breaker to operate, thereby removing power from the elevator(s) within the common hoistway or controlled by equipment in a common machine room. Cars sharing the same hoistway or the same machine room must have power removed independently from cars within other hoistways or those controlled from equipment in other machine rooms.

Note: The industry expects that the removal of elevator power (caused by operation of the heat detector) will not trap any occupants on the elevator because sequences under Phase I Emergency Recall Operation will have already moved the car(s) to the designated recall level or alternate recall level and placed the doors in the open position. Smoke detection required for Phase I Emergency Recall Operation initiation is to be provided at all of the spaces where heat detection is provided for power shut down.

- b. Provide 57° C (135° F) rate compensation heat detectors within two feet of each sprinkler in the elevator machine room, hoistway, and pit in accordance with NFPA 72. Higher temperature rated heat detectors may be used where local conditions warrant; however, the heat detectors must have a lower temperature rating than the sprinklers. The sprinklers in the elevator machine rooms, hoistways, and pits must be standard



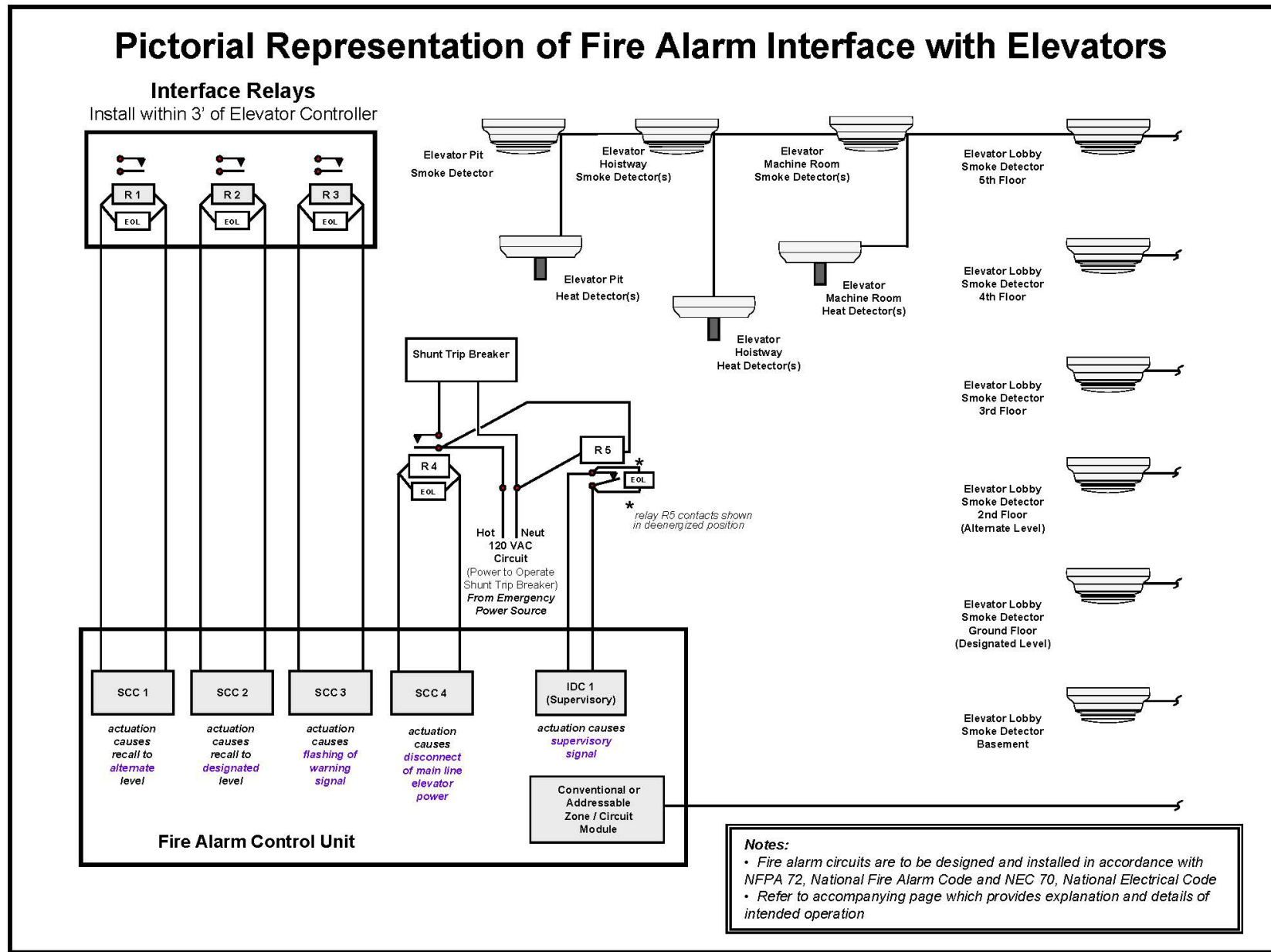
response type; quick response sprinklers are prohibited in these areas.

- c. Provide a supervised control circuit from the fire alarm system to a supervised relay within three feet of the shunt breaker. This signal is the input to remove the mainline power to the elevator.
- d. Provide a 110-vac power source to the shunt breaker independent of the elevator controller. This power circuit must be supervised by the fire alarm system as a supervisory signal.

Note: The shunt breaker requires 110-vac to operate and the source must be independent of the elevator in accordance with ANSI A17.1. The intent of the code is to have to a reliable power source and not to rely on one that may be on fire. Without supervision of the 110-vac power circuit needed for the shunt breaker, the condition of the power necessary for the shunt breaker to operate during a fire is unknown. There have been instances where the breaker to the 110-vac power source for the shunt breaker has been turned off and the elevator power would not shunt upon operation of the heat detector.

3. Fire alarm system elevator interface summary: As described above and in Table 7-4, there can be up to five supervised control circuits from the fire alarm system that will interface with the elevator system. They are as follows (see following pictorial and the accompanying notes):
 - a. Input to elevator controller for Phase I Emergency Recall Operation to the designated level from actuation of smoke detectors other than at the designated level lobby.
 - b. Input to elevator controller for Phase I Emergency Recall Operation to the alternate level from actuation of a smoke detector at the designated level lobby.
 - c. Input to elevator controller to flash the firefighter helmet signal when recall is initiated by a smoke detector in the elevator machine room, hoistway, or pit.
 - d. Input to elevator main line power shunt trip breaker for power shut down from actuation of heat detectors in the hoistway, machine room, or pit (where sprinklers are provided.)
 - e. Supervision of the 110-vac power source to the shunt breaker (where sprinklers are provided.)





Explanation of Fire Alarm Interface with Elevators

Notes:

- There can be many variations of the accompanying “Pictorial Representation of Fire Alarm Interface with Elevators.”

In this example, the smoke and heat detectors are addressable initiating devices and the operating relays are “hardwired.”

- To achieve supervision, the relay circuits are operated from supervised control circuits. Sometimes NACs (Notification Appliance Circuits) are used to accomplish this function.
- The supervisory initiating device that monitors the power for the shunt trip circuit is connected to a supervisory IDC (Initiating Device Circuit).
- The scenario assumes that:
 1. There is a sprinklered elevator hoistway and elevator pit.
 2. Means to disconnect the main line power to the elevator is via a shunt trip breaker.
 3. System operation is in accordance with NFPA 72.
 4. Relay (R5) and an IDC (Initiating Device Circuit) have been included to provide indication (via a supervisory signal) of absence of voltage (power) to operate shunt trip breaker.

<u>Components</u>	<u>Function</u>
R1-----	Signal to elevator controller for recall to designated level.
R2-----	Signal to elevator controller for recall to alternate level.
R3-----	Signal to elevator controller for firefighter notification.
R4-----	Signal to activate shunt trip relay.
R5-----	Supervisory relay to monitor presence of voltage (power) to operate shunt trip breaker.
SCC1-----	Supervised Control Circuit for operating R1.
SCC2-----	Supervised Control Circuit for operating R2.
SCC3-----	Supervised Control Circuit for operating R3.
SCC4-----	Supervised Control Circuit for operating R4.
IDC1-----	Initiating Device Circuit to supervise R5 contacts (monitoring power to operate shunt trip breaker).



- I. Fire alarm systems must monitor each water storage tank dedicated only for fire protection use (if applicable) for low level and low temperature and must provide supervisory signals (monitoring is not required if the water storage tank is for combined fire protection and domestic use).

7.5 Communications between Buildings:

- A. Buildings must communicate trouble, supervisory, and alarm signals to a main 24-hour staffed location such as the telephone operator or VA police. This is in addition to VA fire department notification. Provide a printer to make a hard copy of all signals and operator responses. A backup printer is recommended at another 24-hour staffed location. Coordinate with the facility.

Note: Trouble and supervisory signals will be handled at the 24-hour staffed location. The facility will have to institute a system to handle supervisory signals immediately as required by the NFPA 72.

- B. Where staff response to carry out the fire plan is required from more than one building, provide notification to other buildings. Coordinate with the facility.

7.6 Carbon Monoxide Detection:

- A. Carbon monoxide detection must be provided as required by NFPA 101.
- B. Existing family living units of one- or two-family dwellings or multifamily dwellings used as VHA quarters are required to be equipped with CO detectors. Although NFPA 101 only requires CO detection for new facilities, past VHA Policy (VHA Directive 2008-074) required CO detection in new and existing facilities.

-----END-----



APPENDIX AAbbreviations Used in this Design Manual

ABAAS	Architectural Barriers Act
ADA	American with Disabilities Act
AGV	Automatic Guided Vehicle
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
A/E	Architect/Engineer
C	Celsius
CT	Computerized Tomography or CATSCAN
cu	cubic
F	Fahrenheit
FACSUL	Fire Alarm Certificate Service
FM	Factory Mutual
FMERC	Factory Mutual Engineering and Research Corporation
ft	feet
gpm	gallons per minute
HITF	Healthcare Interpretations Task Force
HVAC	Heating Ventilating and Air Conditioning
Hz	Hertz (cycle per second)
IBC	International Building Code
in	inch
kPa	Kilopascals
kVA	Kilovolt Amps
L	liters
L/m	liters per minute
L/s	liters per second
m	meter
mm	millimeter
MRI	Magnetic Resonance Imaging
NBSIR	National Bureau of Standards Information Report
NFPA	National Fire Protection Association
NFC	National Fire Codes



PG	Program Guides
psi	Pounds Per Square Inch
PL	Public Law
QRS	Quick Response Sprinklers
SFPE	Safety and Fire Protection Engineer
sq	square
UL	Underwriters Laboratories
VA	Department of Veterans Affairs
VAC	Volts Alternating Current
VAHBS	VA Hospital Building System
VAMCS	VA Master Construction Specifications



APPENDIX BMandatory References

ANSI / ASME A17.1	Safety Code for Elevators and Escalators
ANSI / ASME A17.3	Safety Code for Existing Elevators and Escalators
FM Approval Manual	
NBSIR 85-3158	Fire Performance of Interstitial Space Construction System (May 1985)
NISTIR 5560	Fire Performance of an Interstitial Space Construction System (February 1995)
NFC	NFPA Codes, Handbooks, Standards, etc.
PL 100-678	Public Buildings Amendment Act
IBC	International Building Code
UL 790	Test Methods for Fire Resistance of Roof Covering Materials

Additional References

Society of Fire Protection Engineers Fire Protection Engineering Handbook
FM Global Property Loss Prevention Data Sheets



APPENDIX C

Applicable Design and Construction Criteria: The following VA documents relating to fire protection are for reference. Go to the VA Technical Information Library to obtain the most current design criteria information available at <https://www.cfm.va.gov/til/>.

Master Specifications (PG-18-1):

<u>TITLE</u>	<u>SECTION</u>
Applied Fireproofing	07 81 00
Firestopping	07 84 00
Commissioning of Fire Suppression Systems	21 08 00
Manual Dry Standpipe Systems	21 12 00
Wet-Pipe Sprinkler Systems	21 13 13
Dry-Pipe Sprinkler Systems	21 13 16
Clean Agent Fire Suppression Systems	21 22 00
Electric-Driven, Fire Pumps	21 30 13
Diesel-Driven, Fire Pumps	21 30 16
Fire Detection and Alarm	28 31 00

Design and Construction Procedures (PG-18-03):

<u>TITLE</u>	<u>TOPIC</u>
Codes, Standards and Executive Orders	01
Drawings	02
VA Hospital Building System	03
Computer Systems	10
Physical Security and Resiliency	17

Standard Details (PG-18-04):

<u>TITLE</u>	<u>DETAIL</u>
Architectural	
Stair Details (Exit Stairs)	SD055100-01
Door Schedule	SD080000-01
Door Schedule, Legend, Notes, and Modifications	SD080000-02
Mechanical Engineering/HVAC	
Pipe/Duct Penetration of Fire/Smoke Barriers	SD078400-01
Fire Protection for Ceiling Outlets	SD230711-01
Smoke Damper Control Diagram	SD230923-09



Access Panel and Door Details	SD233100-09
Section through Typical Fire Damper Installation	SD233100-12
Electrical Engineering	
Electronic Safety and Security Symbols	SD280511-10
Electronic Safety and Security Symbols	SD280511-11
Electronic Safety and Security Symbols	SD280511-12

Other VA Criteria

TITLE

Qualifications and Scope of Services for Fire Protection Engineers	
Minimum Requirements for A/E Submissions (PG-18-15):	
Volume B	Major New Facilities, Major Additions, and Major Renovations
Volume C	Minor and NRM Projects
Volume D	Cemetery Projects
Volume E	Requests for Proposals Design/Build Projects
Volume F	Seismic Upgrade Projects
H-18-08 Seismic Design Handbook	
PG-18-13 Barrier Free Design Standard	
PG-18-14 Room Finishes, Door, and Hardware Schedules	
VA Signage Design Manual	
Design Alerts	
Standards Alerts	
Historic Preservation	



Appendix D
Decision Tool to Determine Occupancy Classifications
for Mixed Occupancies

This is a decision tool to determine whether a building or portion thereof is a healthcare occupancy, an ambulatory healthcare occupancy, or an occupancy other than healthcare and ambulatory healthcare. These questions are based on NFPA 101 (2015 Edition): Sections x.1.1.1; x.1.3; and x.1.4 of Chapters 18/19/20/21; and previous guidance provided in the Health Care Occupancy Classifier, by James K. Lathrop and David M. Birk, P.E., published in the Healthcare Fire Protection Newsletter, January, 1997. This version of the tool was updated by David P. Klein, P.E., and Peter A. Larrimer, P.E., January 2015.

Question 1

In this portion of the building, are healthcare services and sleeping accommodations provided for four or more occupants who are mostly incapable of self-preservation because of age, physical or mental disability, or because of security measures not under the occupants' control?

- If YES: Consider this portion of the building to be a healthcare occupancy.
If NO: Go to Question 2.

Question 2

On a routine basis, are there four or more patients (inpatients, outpatients or a mixture of both) in this portion of the building at the same time who are incapable of taking action for self-preservation under emergency conditions without assistance from others? (Include all incapable inpatients. Include outpatients who are rendered incapable due to the treatment or anesthesia they received in this portion of the building. If emergency or urgent care is provided, include patients who are incapable due to the nature of their injury or illness. Also, note that being confined to a wheelchair does not in itself make a person incapable of taking action for self-preservation.)

- If YES: Go to Question 3.
If NO: Go to Question 7.

Question 3

Is this portion of the building contiguous to a healthcare occupancy?

- If YES: Go to Question 4.
If NO: Consider this portion of the building to be an ambulatory healthcare occupancy.

Question 4

Is this portion of the building intended primarily for outpatient or non-patient use?

- If YES: Go to Question 5.
If NO: Evaluate this portion of the building as a healthcare occupancy, since it is not primarily intended for outpatient or non-patient use.



Question 5

Is this portion of the building separated from the healthcare portions of the building by at least two-hour fire-resistance rated construction?

If YES: Go to Question 6.

If NO: Evaluate this portion of the building as a healthcare occupancy, since it is not properly separated from the healthcare occupancy.

Question 6

On a routine basis, are there four or more inpatients in this portion of the building at the same time who are incapable of taking action for self-preservation under emergency conditions without assistance from others?

If YES: Evaluate this portion of the building as a healthcare occupancy.

If NO: This portion of the building may be evaluated as an ambulatory healthcare occupancy.

Question 7

Is this portion of the building contiguous to a healthcare occupancy?

If YES: Go to Question 8.

If NO: Go to Question 9.

Question 8

Is this portion of the building separated from the healthcare portions of the building by at least two-hour fire-resistance rated construction?

If YES: Go to Question 9.

If NO: Evaluate this portion of the building as a healthcare occupancy, since it is not properly separated from the healthcare occupancy.

Question 9

Is this portion of the building contiguous to an ambulatory healthcare occupancy?

If YES: Go to Question 10.

If NO: This portion of the building may be evaluated as occupancy other than healthcare or ambulatory healthcare.

Question 10

Is this portion of the building separated from the ambulatory healthcare portions of the building by at least 1-hour fire resistance rated construction?

If YES: This portion of the building may be evaluated as occupancy other than healthcare or ambulatory healthcare.

If NO: Evaluate this portion of the building as an ambulatory healthcare occupancy, since it is not properly separated from the ambulatory healthcare occupancy.

-----END-----



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