



FIRE PROTECTION AND LIFE SAFETY DESIGN STANDARDS

Release 1.0
April 2011

Released by:
Cleveland Clinic
9500 Euclid Ave.
Cleveland OH 44195

All information within this Document is considered **CONFIDENTIAL and PROPRIETARY**. By receipt and use of this Document, the recipient agrees not to divulge any of the information herein and attached hereto to persons other than those within the recipients' organization that have specific need to know for the purposes of reviewing and referencing this information. Recipient also agrees not to use this information in any manner detrimental to the interests of Cleveland Clinic.

**Cleveland Clinic
Design Standards
Copyright © 2011
By the Cleveland Clinic**

These Standards, or parts thereof, may not be reproduced in any form without the

permission of the Cleveland Clinic.

Cleveland Clinic

Cleveland Clinic Design Standards: Fire Protection and Life Safety

The following pages contain guidelines for the design and construction of new and renovated facilities at all domestic Cleveland Clinic locations. They shall be used by A/E firms in the preparation of drawings and specifications for construction of facilities.

The general purpose of Design Standards is to provide minimal criteria for design, materials, and equipment at Cleveland Clinic facilities regarding Codes and FM Global compliance, warranty, approved products, execution and uniformity.

The Standards are not Contract Specifications, but used to prepare more detailed, project specific specifications. The Standards are intended to be used to address system design aspects of equipment that Cleveland Clinic desires to standardize among facilities, and identify prohibited materials and construction practices.

The use of these Standards is mandatory for all design or maintenance projects. Deviations are discouraged. If project conditions arise which require a deviation, it shall be thoroughly documented by the user and submitted to Cleveland Clinic for review and approval using the Design Standards Revision Request document. Additionally, all Cleveland Clinic staff, architects, engineers, and contractors are encouraged to participate in the ongoing development of these guidelines by communicating any suggestions by use of the Revision Request document.

**CLEVELAND CLINIC
FIRE PROTECTION & LIFE SAFETY DESIGN STANDARDS
TABLE OF CONTENTS**

1	INTRODUCTION	1
2	GENERAL	1
2.1	Purpose	1
2.2	Application	1
2.3	Applicable Codes, Standards, Guidelines, and References	2
2.4	Equipment	2
2.5	Cleveland Clinic Contacts	3
2.6	Abbreviations	3
2.7	Definitions	3
2.8	Fire Protection during Construction and Renovation	4
2.9	Document Submittal	4
2.10	Role of the Fire Protection Engineer	7
2.11	Permitting	7
3	BUILDING FEATURES	8
3.1	Construction Type	8
3.2	Occupancy Classification	8
3.3	Smoke Barriers, Smoke Partitions, and Fire Barriers	8
3.4	Interior Finish and Furnishings	10
3.5	Smoke Control Systems	11
3.6	Health Care Suites	11
3.7	Horizontal Exits	12
3.8	Elevators	13
3.9	Protection of Openings	14
3.10	Doors	14
3.11	Firestopping	14
3.12	Sprayed on Fireproofing	14
4	SPECIAL OCCUPANCY REQUIREMENTS	14
4.1	Linen Storage Rooms	14
4.2	Storage Rooms	14
4.3	Laundry and Rubbish Chutes	15
4.4	Trash Collection Rooms	16
4.5	Technology Rooms (IT Rooms)	16
4.6	Electrical Rooms	17
4.7	Health Care Corridor Alcoves	17
4.8	High-Rise Buildings	18
4.9	Laboratories	18
4.10	Atriums and Other Vertical Openings	19
4.11	Food Preparation Facilities	19
4.12	Pharmacies	19
4.13	Utility Rooms and Shop Areas	20
4.14	Health Care Gift Shops	20
4.15	Behavioral Health Areas and Holding Areas	20

4.16	On-Call Rooms	20
5	MEANS OF EGRESS	21
5.1	Travel Distance	21
5.2	Number of Exits	21
5.3	Corridors	21
5.4	Stairs	21
5.5	Exit Signage	22
6	WATER SUPPLY FOR FIRE PROTECTION	22
6.1	Adequacy of Water Supply	22
6.2	Capacity	23
6.3	Fire Pumps	23
6.4	Distribution System	24
6.5	Hydrants	25
6.6	Fire Department Connection	26
6.7	Backflow Preventers for Fire Protection Systems	26
6.8	Forward Flow Test Connections	26
6.9	Pressure Reducing Valves	27
7	FIRE EXTINGUISHING SYSTEMS	27
7.1	Design Criteria	27
7.2	Zoning Requirements	28
7.3	Portable Fire Extinguishers	29
7.4	Fire Extinguisher Cabinets	31
7.5	Standpipes and Fire Hose Connections	31
7.6	Sprinkler Systems	32
7.7	Supplemental Suppression Systems for Special Hazards	34
7.8	Extinguishing Systems for Cooking Facilities and Equipment	35
7.9	Signage & Valve Marking	35
8	FIRE ALARM	37
8.1	General Requirements	37
8.2	Initiation	37
8.3	Occupant Notification	40
8.4	Emergency Control Functions and Interfaces	41
8.5	Circuits and Pathways	41
8.6	Control Panels	42
8.7	Supervision, Annunciation, and Reporting	43
8.8	Sequence of Operations	44
8.9	Fire Command Center	44
8.10	Signage	44
9	VENTILATION	44
9.1	Air Duct Accessories (fire and smoke dampers)	44
9.2	Ductwork Smoke Detection	45
	APPENDIX A	47
A.1	Master Specifications	48
A.2	Plan Review Checklists	49
A.3	Fire Extinguishers in Corridors	54
A.4	Sequence of Operations	56

CLEVELAND CLINIC FIRE PROTECTION & LIFE SAFETY DESIGN STANDARDS

1 INTRODUCTION

The Cleveland Clinic is committed to the life safety of all patients, visitors, and staff. The Fire Protection & Life Safety Design Standards (Design Standards) have been developed with the intent to promote a holistic approach to fire protection and life safety systems design. Through the integration of multi-disciplinary design features and a defend in place approach, the objective is to provide an environment that is reasonably safe from a single fire source and products of combustion in new construction and renovation projects. The Design Standards apply to all Cleveland Clinic facilities, owned and leased. The Design Standards are a tool for Cleveland Clinic contractors and employees and a minimum standard for contractual compliance.

2 GENERAL

2.1 Purpose

- A. These Design Standards establish a minimum level of fire protection and life safety for all Cleveland Clinic facilities by building upon current code requirements, utilizing the latest recommended industry practices, and specifying additional requirements deemed appropriate by Cleveland Clinic.
- B. These Design Standards supersede previous fire protection and life safety standards published by Cleveland Clinic which are dated prior to the issuance of these Design Standards.
- C. There are two main goals of these Design Standards:
 - 1. Provide a fire-safe environment for patients, visitors, and staff.
 - 2. Protect the property from fire and smoke damage.

2.2 Application

- A. This document applies to new construction and renovation projects at all Cleveland Clinic facilities, including owned and leased facilities. Use these Design Standards in conjunction with other standards published by Cleveland Clinic. Where conflicts arise between published documents, seek written resolution from the CC Director of Facilities Compliance.
- B. **The intent of this document is to supplement the codes and standards applicable in the jurisdiction. Where conflicts arise between this document and applicable codes adopted by the jurisdiction, the most stringent provisions apply. It is not the intent of this document to**

reduce or eliminate applicable code provisions adopted by law.

- C. For code interpretation and enforcement, the AHJ for all Cleveland Clinic construction projects is ultimately the CC Director of Facilities Compliance.

2.3 Applicable Codes, Standards, Guidelines, and References

- A. During concept design, the Architect/Engineer (A/E) is responsible for submitting the list of applicable codes, standards, guidelines, and references to the CC Director of Facilities Compliance for approval.
- B. Cleveland Clinic adopts the 2000 *Life Safety Code* (NFPA 101) and standards specifically referenced by NFPA 101, except when state and local requirements are more stringent. The intent of this requirement is to adopt the edition of NFPA 101 enforced by The Joint Commission (TJC) and Center for Medicare and Medicaid Services (CMS). The A/E is responsible for confirming these editions early in the design process.
- C. State and local codes adopted by the jurisdiction apply to all CC designs. The A/E is responsible for documenting the state and local codes applicable in the jurisdiction. Where conflicts arise between state/local codes and NFPA 101, the most stringent applies.
- D. In addition, the A/E is responsible for including a list of the applicable design standards referenced in the appendices of the applicable codes. The A/E must provide written justification to the CC Director of Facilities Compliance for use of a standard (or edition of standard) not specially referenced by the applicable codes.
- E. If a NFPA 101A analysis for existing buildings is permitted by the AHJ, the analysis must be prepared by a Fire Protection Engineer (as defined by this document) and reviewed by the CC Director of Facilities Compliance.
- F. The following FM Global Loss Prevention Data Sheets shall be referenced for all projects. Additional data sheets may be required for special projects.
 - 1. 2-0 Installation Guidelines for Automatic Sprinklers
 - 2. 3-0 Hydraulics of Fire Protection Systems
 - 3. 3-7 Fire Protection Pumps
 - 4. 3-26 Fire Protection Water Demand for Non-storage Sprinklered Properties
 - 5. 7-88 Flammable Liquids Storage Tanks

2.4 Equipment

- A. All equipment specified in fire protection designs must be tested and listed or approved by a nationally recognized testing laboratory for its intended use. If no listed or approved equipment exists for a particular application, written approval for an equivalent item may be issued by the CC Director of Facilities Compliance.

- B. All equipment specified in fire protection designs must be compatible with existing equipment.
- C. All equipment shall be installed as required by the applicable codes, standards, and manufacturer's recommendations.

2.5 Cleveland Clinic Contacts

- A. Director of Facilities Compliance: Paul Dzurinda, dzurinp@ccf.org
- B. Director of Planning and Design: Joe Strauss, strausj2@ccf.org
- C. Fire and Life Safety Manager: Jeff Combs, combsj@ccf.org
- D. Environmental Health and Safety Fire Protection Engineer: Sam Solhdoost (solhdos@ccf.org) or Pamela Reno (renop@ccf.org)
- E. Facilities Compliance Fire Protection Engineer: Garland Baker, bakerg3@ccf.org

2.6 Abbreviations

- A. A/E: Architect/Engineer
- B. AHJ: Authority Having Jurisdiction
- C. CC: Cleveland Clinic
- D. CMS: Centers for Medicare and Medicaid Services
- E. EHS: Environmental Health and Safety
- F. EHS FPE: Environmental Health and Safety Fire Protection Engineer
- G. FM: FM Global (formerly Factory Mutual)
- H. FCFPE: Facilities Compliance Fire Protection Engineer
- I. FLSM: Fire and Life Safety Manager
- J. FPE: Fire Protection Engineer
- K. TJC: The Joint Commission
- L. IT: Information Technology
- M. NFPA: National Fire Protection Association
- N. PRV: Pressure Reducing Valve
- O. UL: Underwriters Laboratories

2.7 Definitions

- F. Atrium: An opening connecting two or more stories that is covered at the top

and is used for purposes other than enclosed stairways, elevators, hoistways, escalators, or as a utility shaft used for plumbing, electrical, air-conditioning or other equipment.

- G. Authority Having Jurisdiction: An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.
- H. Computer Room: Location of the main servers.
- I. Design Standards: This term refers to the Cleveland Clinic Fire Protection & Life Safety Design Standards.
- J. Fire Protection Engineer:
 - 1. A Professional Engineer who has passed the fire protection examination as administered by the National Council of Examiners for Engineering and Surveying (NCEES), **OR**
 - 2. A Professional Engineer in a discipline other than fire protection with a documented minimum of eight (8) years of experience with the design of fire protection and life safety systems for healthcare occupancies, which includes application of NFPA 101, **OR**
 - 3. A qualified engineer approved by the CC Director of Facilities Compliance.
- K. High-rise Building: A building where the floor of an occupiable story is greater than 75 ft. above the lowest level of fire department vehicle access.
- L. IDF / IC Room: Cable termination room. In CC facilities this is called a Technology Room.
- M. MDF Room: Main Distribution Frame / Main Equipment Room
- N. Technology Room: IDF / IC room located in a CC facility

2.8 Fire Protection during Construction and Renovation

- A. Contact the CC Environmental Health and Safety (EHS) Department for the current policy for fire protection during construction and renovation.

2.9 Document Submittal

- A. Design Analysis
 - 1. A fire protection design analysis is required for all designs and must address the fire protection requirements of the project as required by this Design Standard. The fire protection design analysis must be prepared by the project Fire Protection Engineer. The fire protection design analysis must be summarized and submitted with the first design submission separate from other disciplines. Where applicable,

discuss the following minimum fire protection provisions:

- a. Building code analysis (i.e. type of construction, height and area limitations, and building separation or exposure protection)
- b. Classification of occupancy
- c. Compliance with this Design Standard
- d. Requirements for fire-rated walls, fire-rated doors, fire dampers with their fire-resistive ratings, smoke compartmentation, smoke barriers
- e. NFPA 101, Life Safety Code as adopted by TJC and CMS
- f. Analysis of automatic suppression systems, including analysis of required water demand
- g. Water supply analysis, water distribution, and fire hydrant layout
- h. Smoke control methods and smoke control systems
- i. Fire alarm system (system type, functionality, locations of major equipment, type of network connection, survivability of circuits, monitoring, etc.)
- j. Fire detection system (type of system and location of detectors)
- k. Standpipe systems and fire extinguishers
- l. Interior finish
- m. Identify various occupancies and hazardous areas
- n. Fire department access

B. A/E Design Requirements

1. Fire Suppression Design Drawings: Fire suppression drawings must identify locations of major equipment, including, but not limited to fire pumps, risers, pre-packaged equipment, zone/test assemblies, and associated equipment. In addition, fire suppression drawings shall identify hazards, minimum design densities, size and locations of main piping, locations of drain terminations, and system interlocks. Locations of sprinkler heads and branchline piping are not required. Provide a riser diagram indicating, at a minimum, locations of sprinkler risers and standpipes, drain risers, zone/test assemblies, and valves.
2. Fire Alarm Design Drawings: Fire alarm design drawings must identify the locations of field installed components and interconnected devices. Point-to-point wiring is not required to be shown on design documents. Provide a riser diagram showing hierarchy, arrangement, zoning of the system, and interconnections with other systems and equipment. Identify all typical circuits, interconnections, and interlocks necessary for associated controls. Do not identify every field device individually on the riser diagram, such as smoke detectors and heat detectors. Fire alarm devices, including, but not limited to initiating devices and notification appliances, shall be shown in plan view. Provide a sequence of operation matrix in accordance with NFPA 72 and the typical arrangements referenced in Section 8.8.

C. Plan and Spec Review

1. Full sets of design development drawings must be issued on paper or PDF format to the CC FCFPE no less than 75% complete. Do not submit drawings larger than half size.
 2. Specifications must be issued in book form.
 3. Life Safety floor plans must be in the electronic format specified by CC. Life Safety plans should include exit paths, rated partitions, partitions, occupant load, travel distance, smoke zones, smoke detectors and HVAC return air openings, fire extinguisher locations, fire alarm pull stations, fire alarm control panel, remote annunciator panel, and egress capacity. Fire alarm pull stations, fire alarm control panel, and remote annunciator panel should be shown with the color red on separate layer specific for them. See Section 7.3, Portable Fire Extinguishers, for drawing requirements for fire extinguishers. Refer to the CC Drawing Standards for details on drawing layers, colors, etc. Refer to Chapter 6 of NFPA 170 (2009 edition) for fire protection symbols. Plans should be issued on paper. The electronic file shall be in color per the CC Drawing Standards.
 4. All fire alarm and fire suppression drawings must be stamped by the designer prior to permit submittal (include name and certification number).
 5. Locations for wall and ceiling mounted notification devices and fire extinguishers must be approved by the CC FCFPE, CC Aesthetics Committee, and the chief architect at the 75% design submittal.
 6. A comprehensive code review (2000 edition of NFPA 101, FM Global, building code, and other applicable codes) must accompany all life safety plans.
 7. A completed CC Plan Review Checklist must be included with all submittals. The Checklist is located in the Appendix.
- D. Shop Drawing Requirements
1. Fire Sprinkler Shop Drawings
 - a. Drawings must be prepared in the electronic format specified by CC.
 - b. For all new building construction projects and modification/addition projects, contractors are required to submit one (1) set of shop drawings (in pdf format) and calculations to the CC FCFPE and one (1) copy to the CC Owner's Representative for review and approval prior to submittal to the authority having jurisdiction for permit. The CC FCFPE will review the drawings with FM Global. Drawings must be prepared by a minimum NICET Level III Technician or FPE. The Contractor must allow for a minimum two (2) week review period to receive written comments from CC.
 - c. At the end of the project, as-built drawings are required to be prepared electronically and sent to the CC FCFPE one week after

the acceptance test. Off campus sites require delivery to facilities management.

2. Fire Alarm Shop Drawings

- a. Drawings must be prepared in the electronic format specified by CC.
- b. For all new building construction projects and modification/addition projects, contractors are required to submit one (1) set of shop drawings and calculations to the CC FCFPE and one (1) copy to the CC Owner's Representative for review and approval prior to submittal to the authority having jurisdiction for permit. The CC FCFPE will review the drawings with FM Global. Drawings must be prepared by a minimum NICET Level III Technician or FPE. The Contractor must allow for a minimum two (2) week review period to receive written comments from CC.
- c. At the end of the project, as-built drawings are required to be prepared electronically and sent to the CC FCFPE one week after acceptance test. Off campus sites require delivery to facilities management.
- d. Adhere to the following drawing submittal procedure:
 - The A/E Electrical Engineer shall submit marked up shop drawings to the CC FCFPE.
 - The Fire Alarm Provider shall electronically update shop drawing changes and return to the electrical contractor.
 - Electrical contractor will return drawings to the CC FCFPE and the CC Office of Construction Owner's Representative.

2.10 Role of the Fire Protection Engineer

- A. All design and construction projects must elicit the services of a Fire Protection Engineer as defined in Section 2.7. A resume of the FPE must be approved by the CC Director of Facilities Compliance. The FPE must be included in all phases of the design process and is responsible for reviewing the design documents for compliance with applicable codes and standards, including the Cleveland Clinic Fire Protection & Life Safety Design Standards.

2.11 Permitting

- A. CC Permitting
 1. Contact the CC Environmental Health and Safety Department for the required permits.

3 BUILDING FEATURES

3.1 Construction Type

- A. For new construction, consider future expansion of the building and adjust the type of construction accordingly. Document analysis as part of the schematic design narrative.

3.2 Occupancy Classification

- A. Per NFPA 101, where incidental to another occupancy, areas used as follows shall be permitted to be considered part of the predominant occupancy and shall be subject to the provisions of NFPA 101 that apply to the predominant occupancy:
 - 1. Mercantile, business, industrial, or storage use
- B. Refer to the applicable building code for area limits for accessory occupancies.

3.3 Smoke Barriers, Smoke Partitions, and Fire Barriers

A. Smoke Barrier

- 1. Definition - A continuous membrane or a membrane with discontinuities created by protected openings, where such membrane is designed and constructed to restrict the movement of smoke and fire. A smoke barrier has a 1-hour fire-resistance rating. Refer to Architectural Design Standards for a sketch.
- 2. Continuity - Smoke barriers shall be continuous from an outside wall to an outside wall, from a floor to a floor, or from a smoke barrier to a smoke barrier, or by use of a combination thereof.
- 3. Location - Health care occupancies shall be subdivided by smoke barriers for the following scenarios:
 - a. To divide every story used by inpatients for sleeping or treatment into not less than two smoke compartments.
 - b. To divide every story having an occupant load of 50 or more persons, regardless of use, into not less than two smoke compartments.
 - c. To limit the size of each smoke compartment to an area not exceeding 22,500 square feet.
 - d. To limit the travel distance from any point to reach a door in the required smoke barrier.

B. Smoke Partition

- 1. Definition - A continuous membrane that is designed to form a barrier to limit the transfer of smoke. A fire rating is not required for smoke partitions. Refer to Architectural Design Standards for a sketch.
- 2. Continuity - Smoke partitions shall extend from the floor to the underside

of the floor or roof deck above unless the requirements have been met to terminate at the underside of a ceiling that is constructed to limit the transfer of smoke. Smoke partitions may not terminate at “lay in” ceiling tiles.

3. Location – Refer to Table 3.3a and 3.3b.

C. Fire Barrier

1. Definition - A continuous membrane or a membrane with discontinuities created by protected openings with a specified fire protection rating, where such membrane is designed and constructed with a specified fire resistance rating to limit the spread of fire, that also restricts the movement of smoke. A fire barrier may be vertically or horizontally aligned, such as a wall or floor assembly. Refer to Architectural Design Standards for a sketch.
2. In areas where glass walls are used as a fire barrier, window sprinklers that are listed or approved to achieve a 2-hour barrier may be used if approved by the local AHJ. A gasketed frame may be required to comply with the building code requirements.
3. Location – Refer to Table 3.3a and 3.3c.

D. Summary of areas requiring smoke partitions or fire barriers:

Table 3.3a Separation Requirements for Health Care (I-2) Occupancies

Area Description	Protection/Separation
Rubbish and laundry chute terminal room	Fire barrier with required rating of the chute enclosure
Rubbish and laundry access room	Fire barrier with required rating of the chute enclosure
Rooms with collected trash in volume exceeding 64 gallons	1-hour fire barrier
Rooms with soiled linen in volume exceeding 64 gallons	1-hour fire barrier
Clean linen storage rooms > 100 square feet	1-hour fire barrier
Storage rooms larger than 50 square feet but not exceeding 100 square feet	Smoke partition
Storage rooms > 100 square feet	1-hour fire barrier
Laboratories that use hazardous materials in quantities less than those that would be considered a severe hazard per NFPA 99	Smoke partition
Laboratories that use hazardous materials	1-hour fire barrier

Area Description	Protection/Separation
that would be classified as a severe hazard per NFPA 99	
Physical plant maintenance shops	1-hour fire barrier
Paint shops with hazardous substances and materials in quantities less than those that would be classified as a severe hazard	1-hour fire barrier
Pharmacies that are considered a hazardous area	1-hour fire barrier

Table 3.3b Separation Requirements for Ambulatory Health Care (Business)

Area Description	Protection/Separation
Storage rooms > 100 square feet	Smoke partition
Waste and linen collection rooms > 100 square feet	Smoke partition

Table 3.3c General Separation Requirements

Area Description	Protection/Separation
Generator Rooms	3-hour fire barrier*
Fire Pump Rooms	1-hour fire barrier**
Electrical rooms housing equipment greater than 600 Volts	3-hour fire barrier
Electrical rooms housing individual dry-type transformers greater than 112.5 kVA	1-hour fire barrier
Elevator machine room	Fire barrier with required rating of the hoistway

*Per FM Data Sheet 7-88, Flammable Liquids Storage Tanks

**Per FM Data Sheet 3-7: 1-hour fire barrier if the pump room and adjacent areas are protected with an automatic sprinkler system, otherwise a 2-hour barrier is required.

3.4 Interior Finish and Furnishings

A. Floor Finishes:

1. In all areas, floor covering materials shall comply with the DOC FF-1 “pill

test”.

2. Minimum critical radiant flux:
 - a. Health care = Class II
 - b. Business / ambulatory care = no requirements for class I or class II
3. Material section shall include consideration of materials needed to clean, wax, or strip floors. Toxic chemicals shall not be used in CC facilities.

B. Wall and Ceiling Finishes are summarized in the following table:

Table 3.4

	Exits and exit passageways	Exit access corridors	Rooms and enclosed spaces
New Healthcare	A or B	A or B	A or B (C in small individual rooms)
New Business / Ambulatory Care	A or B	A, B, or C	A, B, or C

- C. All wall and ceiling finish product data with class/rating information must be submitted to the CC EHS Department to review.
- D. Vinyl Composition Tile (VCT) is prohibited. Bio-based, static-dissipating tile shall be used in computer rooms.
- E. Halogen-free flame retardants shall be specified where halogen-free products are available.
- F. Remove low-density fiberboard ceilings and flammable glue from existing buildings as part of new construction projects.
- G. All wood installed for mounting surfaces in electrical and IT rooms shall be fire-retardant-treated plywood. When painting, leave a minimum of one manufacturer’s marking per sheet exposed for visual confirmation that the product meets this requirement.

3.5 Smoke Control Systems

- A. Refer to NFPA 92A and 92B for smoke control requirements, as referenced by NFPA 101 or the building code.
- B. A smoke control system is required for atriums unless there is an exception in both the applicable building code and NFPA 101.
- C. Anesthetizing locations must comply with NFPA 99.

3.6 Health Care Suites

- A. General
 1. Suites shall be separated from other areas of the building by a smoke partition.
 2. Patient sleeping rooms shall be provided with smoke detection and a

swing free closer.

3. When two remote exit access doors are required, one of the means of egress must be directly into a corridor and the second way may be into another complying adjacent suite or an exit stair, exit passageway, or exit direct to the exterior.

- B. The following table provides a summary of NFPA 101 requirements for patient sleeping suites and non-sleeping suites:

Table 3.6 NFPA 101 Suite Requirements

Suite Requirements	2000 NFPA 101	
	Non-sleeping	Sleeping
Area	> 2,500 sq. ft. and ≤ 10,000 sq. ft.	> 1,000 sq. ft. and ≤ 5,000 sq. ft.
Number of exits	two	two
Type of exits	remote with formula	remote with formula
Type of intervening room	non-hazardous	non-hazardous
Doors on perimeter of suite	Positive latching and smoke resistant, but not self-closing	Positive latching and smoke resistant, but not self-closing
Doors inside of suite	no restrictions	no restrictions
Travel distance to corridor exit door with one intervening room	100 ft.	-
Travel distance to corridor exit door with two intervening rooms	50 ft.	-
Number of exits required from an exit access corridor outside of the suite where there are no intervening rooms	two	two
Minimum clear and unobstructed width of corridors inside suite	36 inches	36 inches
Travel distance from anywhere in a suite to an exit	200 ft.	200 ft.
Room door required as an exit access and an exit	150 ft.	150 ft.
Any point in a health care sleeping room and an exit access door in that room	-	50 ft.
Any point in a suite of sleeping rooms and an exit access door of that suite	-	100 ft.

3.7 Horizontal Exits

- A. For health care occupancies, horizontal exits may provide up to 2/3 of the total required egress capacity for the fire area.
- B. Class I standpipe hose connections are required on each side of the wall adjacent to the exit opening of a horizontal exit, except where floor areas adjacent to a horizontal exit are reachable from exit stairway hose

connections by a 30-foot hose stream from a nozzle attached to 100 feet of hose.

3.8 Elevators

- A. Cleveland Elevator Department prohibits the installation of sprinklers at the top of elevator shafts and inside elevator machine rooms. Sprinklers may be installed in elevator pits.
- B. For new construction, the sprinkler required at the top of the elevator hoistway is not required where the hoistway for passenger elevators is noncombustible and the car enclosure materials meet the requirements of ASME A17.1, Safety Code for Elevators and Escalators.
- C. Hoistways
 1. Unsprinklered elevator hoistways
 - a. Fire alarm initiating devices used to initiate Phase I Emergency Recall Operation shall be installed in the following locations:
 - At each floor elevator lobby served by the elevator
 - In the associated elevator machine room, control space, or control room
 - b. Elevator shunt trip is not required when sprinklers are not provided.
 2. Sprinklered elevator hoistways (existing construction)
 - a. Fire alarm initiating devices used to initiate Phase I Emergency Recall Operation shall be installed in the following locations:
 - At each floor elevator lobby served by the elevator
 - In the associated elevator machine room, control space, or control room
 - In the elevator hoistway
- D. Where sprinklers are installed in elevator machine rooms or the top of elevator hoistways, power shunt trip shall be provided. A heat detector located within 2 feet of each sprinkler in the hoistway and machine room shall be used to activate the shunt trip. The heat detector must have a lower temperature rating and a higher sensitivity as compared to the sprinkler.
- E. Where sprinklers are provided in elevator machine rooms, an isolation valve shall be provided outside the room.
- F. The elevator machine room must have an identical fire rating to that of the hoistway in order to maintain the rated integrity of the hoistway enclosure.

3.9 Protection of Openings

- A. Openings through a floor/ceiling assembly must be protected by a shaft enclosure, unless the opening can be classified as an atrium, convenience opening, or communicating space.
 - 1. Shaft enclosures must have a fire-resistance rating of not less than 2 hours where connecting four stories or more, and not less than 1 hour where connecting less than four stories. Shaft enclosure shall not be less than the fire rating of the floor/ceiling assembly that it penetrates.
- B. Chutes
 - 2. Refer to Section 4.3.

3.10 Doors

- A. Hardware
 - 1. Door-closing devices shall not be required on doors in corridor wall openings other than those serving required exits, fire barriers, smoke barriers, horizontal exits, patient sleeping rooms, or enclosure of vertical opening and hazardous areas.
- B. Doors for on-call rooms shall have a self-closing device.
- C. Door for patient sleeping rooms shall have a swing free closer.
- D. All fire doors and frames must be labeled. Frames are required to reflect the full rating of the fire door leaf or leaves associated.

3.11 Firestopping

- A. Refer to the CC Firestopping and Fireproofing Performance Based Standard for requirements.

3.12 Sprayed on Fireproofing

- A. Refer to the CC Firestopping and Fireproofing Performance Based Standard for requirements.

4 SPECIAL OCCUPANCY REQUIREMENTS

4.1 Linen Storage Rooms

- A. Soiled Linen Storage Rooms
 - 1. Soiled linen storage rooms where soiled linen volume exceeds 64 gallons shall be enclosed with a 1-hour fire barrier.
- B. Clean Linen Storage Rooms
 - 1. Clean linen storage rooms larger than 100 square feet shall be enclosed with a 1-hour fire barrier.

4.2 Storage Rooms

- A. Health Care Occupancy Storage
 - 1. Storage rooms larger than 50 square feet but not exceeding 100 square feet shall be enclosed with a smoke partition and a self-closing door.

2. Storage rooms larger than 100 square feet shall be enclosed with a 1-hour fire barrier.
- B. Business and Ambulatory Health Care Occupancy Storage
 1. Storage rooms in business occupancies shall be enclosed with a smoke partition.
- C. Flammable and Combustible Liquids
 1. In patient care areas, all flammable and combustible liquids shall be kept under the maximum allowable quantities per the applicable building or fire code.
- D. Compressed Gas, Cryogenic Liquid, and Medical Gas
 1. Refer to NFPA 99 for requirements.

4.3 Laundry and Rubbish Chutes

- A. Chute Enclosure
 1. Shaft enclosures must have a fire-resistance rating of not less than 2 hours where connecting four stories or more, and not less than 1 hour where connecting less than four stories. Shaft enclosure shall not be less than the fire rating of the floor/ceiling assembly that it penetrates.
 2. All loading doors into chutes must be provided with a self-closing, side-hinged, positive latching frame and gasketed fire door assembly having a fire protection rating appropriate for protecting the opening.
- B. Sprinkler Protection
 1. Gravity chutes shall be protected internally by automatic sprinklers. A sprinkler shall be installed at or above the top service opening of the chute and at the lowest service level. In addition, a sprinkler shall be installed within the chute at alternate floor levels in buildings over two stories in height.
 2. Automatic sprinklers installed in gravity chute service openings shall be recessed out of the chute area through which the material travels.
 3. Concealed automatic sprinklers shall be installed in chute terminal rooms and access rooms.
 4. Sprinklers in chutes must be connected to the sprinkler system on the floor where they are located.
- C. Chute Access Room
 1. Openings into chutes shall not be located in corridors.
 2. The room used for accessing chute openings shall have a fire-resistance rating not less than the required rating of the chute enclosure.
 3. Rubbish chutes and laundry chutes are permitted to open into rooms not exceeding 400 square feet that are used for storage.
 4. Openings into chute access rooms shall be protected by approved self-closing fire doors that are appropriate for protecting the opening.
- D. Chute Terminal Room

1. Rubbish and laundry chutes shall terminate or discharge directly into a room having a minimum fire resistance rating not less than that specified for the chute enclosure.
2. Openings to chute terminal rooms shall be protected by approved automatic closing or self-closing fire doors appropriate for protecting the opening.

4.4 Trash Collection Rooms

- A. Rooms with collected trash in volume exceeding 64 gallons shall have a 1-hour fire barrier.

4.5 Technology Rooms (IT Rooms)

- A. General
 1. Provide wet pipe or preaction sprinkler systems as required by this section.
 2. Do not run sprinkler piping not serving the room through the room.
 3. Do not run sprinkler piping directly over equipment per NFPA 70.
 4. Provide wire cages for exposed sprinklers that are within 12 feet above the finished floor.
 5. Drainage troughs with water sensors shall be installed under sprinkler piping to protect equipment from any leakage. The intent is to ensure that the troughs are targeted for locations of potential water leakage, and not everywhere. This would include the sprinkler heads in the rooms.
 6. All wood installed for mounting surfaces in IT rooms shall be fire-retardant-treated plywood. When painting, leave a minimum of one manufacturer's marking per sheet exposed for visual confirmation that the product meets this requirement. Use a water based paint for the plywood.
 7. The room name on drawings should be MDF, IDF/IC, or Computer Room. See Section 2.7 for the definitions for these rooms. If the rooms are combined, the room type which has the larger use of the space should be used.
- B. MDF and Computer Rooms
 1. Greater than 200 square feet: Provide a double interlock cross zoned preaction sprinkler system. Provide a shut off valve outside of the room that is supervised by the fire alarm system.
 2. Less than 200 square feet: Provide smoke detection with the wet pipe sprinkler system.
- C. IDF/IC Technology Rooms and Low Voltage Equipment Rooms
 1. Provide smoke detection with the wet pipe sprinkler system.

4.6 Electrical Rooms

- A. Provide a 3-hour fire barrier for electrical rooms housing equipment greater than 600 Volts.
- B. Provide a 1-hour fire barrier for electrical rooms housing individual dry-type transformers greater than 112.5 kVA.
- C. Dry-type transformers 600 volts or less and not exceeding 50 kVA shall be permitted in hollow spaces of buildings not permanently closed in by structure, provided they meet the NFPA 70 ventilation and separation requirements.
- D. Provide wet pipe sprinkler protection. Isolation valves electronically supervised by the fire alarm shall be provided outside transformer and high volt electrical rooms.
- E. Noncombustible hoods or shields shall be provided over switch gear and switch boards to protect equipment from sprinkler discharge.
- F. Provide a double interlock cross zoned preaction sprinkler system for switch gear rooms and generator rooms.
- G. Do not run sprinkler piping not serving the room through the room.
- H. Do not run sprinkler piping directly over equipment as required by NFPA 70.
- I. Provide wire cages for exposed sprinklers that are within 12 feet above the finished floor.
- J. Drainage troughs with water sensors shall be installed under sprinkler piping to protect equipment from any leakage. The intent is to ensure that the troughs are targeted for locations of potential water leakage, and not everywhere. This would include the sprinkler heads in the rooms.
- K. All wood installed for mounting surfaces in electrical rooms shall be fire-retardant-treated plywood. When painting, leave a minimum of one manufacturer's marking per sheet exposed for visual confirmation that the product meets this requirement.
- L. The number of exits from electrical rooms housing equipment greater than 600 Volts shall be per the requirements of NFPA 70, *National Electrical Code*.

4.7 Health Care Corridor Alcoves

- A. Alcoves shall be less than 50 square feet.
- B. Alcoves shall not be used for the storage of combustibles.
- C. Smoke detection must be provided for alcoves.

4.8 High-Rise Buildings

- A. The fire alarm system shall be an approved emergency voice/alarm communication system. See the Section 8.3, Occupant Notification, for more details.
- B. A two-way telephone service shall be provided for fire department use. The communications system shall operate between the emergency command center and every elevator car, elevator lobby, and floor level of exit stairs. A fire department radio system may be approved jointly by the CC Director of Facilities Compliance and local fire department as an equivalent system.
- C. Provide an emergency command center per the applicable building code in a location approved jointly by the CC Director of Facilities Compliance and the local fire department.
 - 1. Size the emergency command center to accommodate a work table and chair.
 - 2. A waterproof box for building floor plans shall be provided.
- D. Provide standby power to the following:
 - 1. Electric fire pump
 - 2. Emergency command center equipment and lighting
 - 3. At least one elevator serving all floors, with standby power transferable to any elevator
 - 4. Mechanical equipment for smokeproof enclosures
 - 5. Mechanical equipment for smoke control system
- E. Provide emergency power per the requirements of the applicable building code.
- F. The evacuation plan shall be jointly approved by the CC EHS FPE and the local fire department.

4.9 Laboratories

- A. General
 - 1. Provide ABC 5-pound fire extinguisher. Mount to the wall on a Grainger back plate.
- B. Laboratories in Health Care Occupancies and Medical Offices
 - 1. Laboratories that use hazardous materials in quantities less than those that would be considered a severe hazard per NFPA 99 shall be enclosed with smoke-resistive construction.
 - 2. Laboratories that use hazardous materials that would be classified as a severe hazard per NFPA 99 shall be enclosed with a 1-hour fire barrier.
- C. Laboratories in Non-Health Care Occupancies

1. Laboratories that use chemicals shall comply with NFPA 45, Standard on Fire Protection for Laboratories Using Chemicals.

4.10 Atriums and Other Vertical Openings

- A. Communicating spaces (mini-atriums), as defined in NFPA 101, are not permitted in health care occupancies.
- B. Communicating spaces in non health care occupancies are required to be open and unobstructed, such that a fire in any part of the space will be readily obvious to the occupants of the space prior to the time it becomes an occupant hazard. Complete automatic smoke detection systems with proper occupant notification features may be substituted for this openness requirement, with the joint approval of the local AHJ and the CC Director of Facilities Compliance.
- C. Convenience openings, as defined in NFPA 101, are permitted when in compliance with all of the following:
 1. Openings do not connect more than two adjacent stories.
 2. Openings are separated from unprotected vertical openings serving other floors by a fire barrier.
 3. Openings are separated from corridors by a smoke partition.
 4. Openings do not serve as a required means of egress.
- D. Atriums are permitted provided that the atrium requirements in NFPA 101 and the building code are met.
- E. Other vertical openings must be enclosed as follows:
 1. 2-hour fire barrier when connecting four or more stories
 2. 1-hour fire barrier for other enclosures
 3. Not less than the fire rating of the floor/ceiling assembly that it penetrates

4.11 Food Preparation Facilities

- A. Commercial cooking equipment shall be in accordance with NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*, and NFPA 17A, *Standard for Wet Chemical Extinguishing Systems*.
- B. Protection or separation of food preparation facilities shall not be required where domestic cooking equipment is used for food warming or limited cooking (microwave ovens, hot plates, toaster, and nourishment centers).
- C. Kitchen suppression system operation will activate the fire alarm.

4.12 Pharmacies

- A. Pharmacies that area considered a hazardous area shall be enclosed with a 1-hour fire barrier.

- B. Pharmacy pass-through windows shall be permitted to be installed in vision panels or doors without special protection, provided that both of the following criteria are met:
 - 1. The aggregate area of openings per room does not exceed 80 square inches
 - 2. The openings are installed at or below half the distance from the floor to the room ceiling
- C. When pneumatic tube conveyors pass through fire barriers, they shall be protected by one of the following methods:
 - 1. The space between the tube and the fire barrier shall be filled with a material that is capable of maintaining the fire resistance of the fire barrier
 - 2. The space between the tube and the fire barrier shall be protected by an approved device that is designed for the specific purpose

4.13 Utility Rooms and Shop Areas

- A. Physical plant maintenance shops shall have a 1-hour fire barrier.
- B. Utility rooms or shop areas larger than 100 square feet storing combustible material shall be protected in accordance with the storage room requirements.

4.14 Health Care Gift Shops

- A. Gift shops not considered hazardous and having separately protected storage shall be permitted to be open to a lobby or corridor if the gift shop does not exceed 500 square feet.

4.15 Behavioral Health Areas and Holding Areas

- A. Provide institution-style sprinklers in behavioral health and holding areas.
- B. Fire extinguisher cabinets located in behavioral health and holding areas must be equipped with a key lock assembly.
- C. Pull stations in behavioral health and holding areas should be located at the nurse's station under supervision and inside the fire exit stair, which is always locked.

4.16 On-Call Rooms

- A. Provide sounder base smoke alarms and strobes in each on-call room. The smoke alarms are provided for the sole purpose of notifying the occupants of the presence of smoke within that room.
- B. Doors for on-call rooms shall have a self-closing device.
- C. Where audible appliances are installed to provide signals for sleeping areas, they must be installed to provide a sound level at the pillow of the greatest of the following scenarios:

1. At least 15 dB above the average ambient sound level
2. 5 dB above the maximum sound level having a duration of at least 60 seconds
3. 75 dBA

5 MEANS OF EGRESS

5.1 Travel Distance

- A. The travel distance shall be in accordance with the most restrictive requirements of 2000 edition of NFPA 101 and the applicable building code.
- B. Travel distance requirements for health care suites are located in Section 3.6.

5.2 Number of Exits

- A. The number of exits from electrical rooms housing equipment greater than 600 Volts shall be per the requirements of NFPA 70, *National Electrical Code*.

5.3 Corridors

- A. New corridors required for exit access in health care occupancies shall not be less than 8 feet in clear and unobstructed width. The dead-end limit is 20 feet.
- B. Corridors in adjunct areas not intended for the housing, treatment, or use of inpatients shall be not less than 44 inches in clear and unobstructed width. Hospitals that are mixed occupancies should refer to the appropriate chapter in NFPA 101 for corridor widths.
- C. There are no requirements for corridor widths inside a suite because, by definition, there are no corridors in a suite. The means of egress width in a suite shall not be less than 36 inches.
- D. Corridor walls in new healthcare facilities must be smoke partitions.

5.4 Stairs

- A. Stair Identification Signs: Stairs serving three or more stories must be provided with signage.
 1. Provide signage within the enclosure at each floor landing in accordance with the CC Signage Department.
 2. Indicate the floor level, the terminus of the top and bottom of the stair enclosure and the identification the stair enclosure.
 3. State the floor level of, and the direction to, exit discharge.
 4. Locate the sign inside the enclosure approximately 5 feet above the floor landing in a position that is readily visible when the door is in the open or closed position.


5. Designate if there is roof access by the words "ROOF ACCESS" or "NO ROOF ACCESS" under the stairway identification letter.
6. Prove a gate at the level of exit discharge to prevent occupants from continuing down the stairs. A sign with the words "NO EXIT" shall be attached to the gate.

5.5 Exit Signage

- A. A directional exit sign should be placed in every location where the direction of travel to reach the nearest exit is not apparent.
- B. Light emitting capacitor (LEC) exit signs are required for new installations. Signs are preferred to be non-transparent and non-translucent.
- C. The word "EXIT" shall be green.

6 WATER SUPPLY FOR FIRE PROTECTION

6.1 Adequacy of Water Supply

- A. Water flow tests 
 1. Water flow tests shall be conducted in accordance with the procedures of FM Global Property Loss Prevention Data Sheet 3-0. The CC FCFPE shall perform or witness the required flow testing prior to the first submittal of the project. When available, current flow test data shall be compared with historical data including an analysis of any discrepancies within the results. When data that is less than one year old is available, it may be used in lieu of new flow tests upon verification of the quality and accuracy of the data.
 2. In-line flow tests are not permitted.
 3. The FPE is responsible for obtaining and evaluating the water distribution system maps and characteristics as part of the water supply analysis.
 4. The FPE must also confirm the accuracy of flow test data and procedures. The FPE shall not rely on data that he/she has not personally validated and must investigate all conditions that may affect the results, such as tanks out of service or pumps running.
 5. The results of the water flow test shall be submitted to the CC FCFPE on the "Sample Report of a Hydrant Flow Test" form located in NFPA 24.
- B. Hydraulic Demand Analysis
 1. Perform the hydraulic demand analysis in accordance with the procedures outlined in FM Global Property Loss Prevention Data Sheet 3-0.
 2. Computer generated hydraulic calculations based on remote area piping layout are required at the shop drawing submittal.
 3. The hydraulic analysis shall clearly document pressure drop through backflow preventers and underground piping to the point of connection of the water supply evaluated by a water flow test within 12 months.
 4. C-factors for existing underground mains shall be clearly documented and

justified.

5. Where a fire pump is required, use residual water pressure available from water supply at 150% fire pump capacity as residual pressure available at pump suction.
6. Include a safety factor of 15% or 10 psi, whichever is less, in the hydraulic calculation. The minimum pressure drop across the backflow preventer shall be calculated based on manufacturer's data.

6.2 Capacity

- A. The capacity of the water supply shall be determined from the design criteria in Section 7.1.
- B. The duration of the water supply shall be 60 minutes for light hazard occupancies or 90 minutes for ordinary and extra hazard occupancies, in accordance with FM Global Loss Prevention Data Sheet 3-26.
- C. When a fire pump is installed, the capacity of the water supply shall be sufficient to supply 150% of the pump's rated flow at a minimum pressure of 20 psi at the supply side of the pump, unless otherwise approved by the CC FCFPE.
- D. When hydraulic calculations indicate that the water supply is not capable of meeting the system flow demand at the required pressure, both distribution system upgrades and individual building storage tanks shall be evaluated. The FPE shall prepare and submit a report to the CC FCFPE summarizing the analysis and providing recommendations for water supply upgrades at the concept design submittal.

6.3 Fire Pumps

- A. General
 1. Design and installation of the fire pump shall comply with the requirements of FM Global Loss Prevention Data Sheet 3-7.
- B. Sizing Criteria
 1. Fire pump shall be sized to meet the system demand at no greater than 140% of the rated pump capacity. Provide the smallest pump required to meet the system demand. Calculate the maximum system pressure at the no flow (churn) condition, and specify high pressure sprinkler piping and fittings if system pressure exceeds 175 psi.
 2. Do not include the standpipe demand in the fire pump size when manual standpipe systems are permitted by the applicable building and fire codes.
- C. Pump Type
 1. Use a horizontal split case centrifugal type pump listed for fire protection service unless a vertical shaft turbine pump is necessary for suction lift. Do not use vertically oriented split case pumps unless approved by the CC FCFPE. Installation of a vertical pump may be considered where space is limited and additional provisions are made for pump maintenance and removal.

D. Pump Drive

1. A variable speed electric motor drive with a single source of reliable power is the preferred arrangement. A reliable power source is defined by FM Global as having infrequent power disruptions from environmental or man-made conditions. An electric power source that has disruptions lasting longer than 8 hours three or more times in a 12-month period is considered unreliable. More frequent short-term outages totaling more than 24 hours cumulatively during a 12-month period would also be considered unreliable.
2. When the power supply is not considered reliable, connect the fire pump to an emergency generator via an automatic transfer switch or use a variable speed diesel engine drive. Do not use electric motor drivers with emergency power backup unless a generator is already being installed for other systems.
3. For health care occupancies, connect the electric drive fire pumps to an emergency generator via automatic transfer switches regardless of the reliability of the primary power source.

E. Pump Arrangement

1. For health care occupancies, a redundant pump shall be provided where the water supply cannot support 25% of the sprinklers in the hydraulically most remote design area with the primary fire pump out-of-service.
2. Where there is more than one fire pump in a grid, such as at the main campus, fire pumps shall be piped in such a way that the facility will never be without fire pump protection. This will be accomplished through zone shut off valves and operational processes as directed by the CC FCFPE.

F. Pressure Maintenance Pumps

1. A pressure maintenance pump (jockey pump) shall be utilized where it is desirable to maintain a uniform or relatively high pressure on the fire protection system. A jockey pump shall be sized to make up the allowable leakage rate within 10 minutes or 1 gpm, whichever is larger.

G. Test Connection

1. The fire protection system must have outlets available to test the fire pump and suction supply piping at 150% fire pump capacity in accordance with NFPA 20.

6.4 Distribution System

A. Distribution Mains

1. The distribution system shall be sized to accommodate fire flows plus domestic and industrial or flushing demands that cannot be restricted during fires. Refer to the appendix in the applicable fire code for fire flow requirements.
2. Distribution shall be looped to provide at least 50% of the required fire flow in case of a single break.

3. Dead-end mains shall be avoided. Written approval from the CC FCFPE is required for design of all dead-end mains.
 4. The minimum pipe size is 6 inches.
- B. Underground Piping
1. Underground piping must be per the requirements in NFPA 24. The contractor shall complete the Contractor's Material and Test Certificate for Underground Piping form and submit to the CC FCFPE.
 2. Provide resilient seal valves.
- C. Valves
1. Control valves shall be provided in each source of water supply, such as pumps.
 2. Control valves must be either post-indicating or outside-stem-and-yoke types.
 3. A sufficient number of sectional valves shall be provided in the distribution system so that not more than a combined total of five hydrants and sprinkler systems, or not more than three sprinkler systems must be out of service due to a single break.
 4. A post indicator shut-off valve shall be provided for each fire main serving a new building. The post indicator valve may be wall type or yard type as approved by the CC FCFPE. The post indicator valve shall be electrically supervised by the fire alarm system for the building it serves.

6.5 Hydrants

- A. Type
1. FM approved dry barrel hydrants shall be provided in areas that are subject to freezing. Wet barrel hydrants may be used where freezing is not a concern.
 2. All hydrants shall have two 2-1/2-inch hose outlets and one 4-1/2-inch suction connection with national standard fire hose threads in accordance with NFPA 24, unless the local municipal fire departments require a nonstandard connection. The City of Cleveland requires a nonstandard connection.
- B. Spacing
1. At least one fire hydrant shall be located within 100 feet of the building's fire department connection.
 2. Provide additional hydrants so that all parts of the building's exterior are within 350 feet of a hydrant with consideration given to accessibility and obstructions.
 3. Sufficient hydrants shall be provided so that hose stream and fire department connection demands can be met without taking more than 1,250 gpm from a single hydrant.

4. Refer to the appendix in the applicable fire code for fire hydrant location and fire apparatus access road requirements.
 5. The CC FCFPE is expected to review fire hydrant type(s) and spacing with the local fire department prior to the shop drawing submittal.
- C. Installation
1. Hydrants must be installed adjacent to paved areas, accessible to fire department apparatus.
 2. Hydrants must not be closer than 3 feet or farther than 7 feet from the roadway shoulder or curb line.
 3. Hydrants must be installed with not less than 6-inch connection to the supply main, and valved at the connection.
 4. The ground must be graded so that any surface drainage is away from the hydrant. Installation must be in accordance with NFPA 24.
 5. Suction connection should be perpendicular to the street to allow straight lined connection to the pumper.
 6. Hydrants located adjacent to parking areas or other vehicle traffic areas shall be protected by bollards. The bollards shall be located so they are not directly in front of an outlet.
- D. Color
1. Hydrant bonnet and cap color shall be in accordance with NFPA 291, *Fire Flow and Marking of Hydrants*, based on flow capacity unless a different scheme is specified by the local fire department.

6.6 Fire Department Connection

- A. Where wall type fire department connections are provided, considerations shall be given such that pressurized hose lines do not obstruct egress paths.
- B. Provide Knox type locking assemblies. Keys will be issued to the AHJ at the time of acceptance.

6.7 Backflow Preventers for Fire Protection Systems

- A. Backflow preventers shall be double check type unless Reduced Pressure Zone (RPZ) type is required by the AHJ. RPZ type backflow preventers are required for antifreeze sprinkler systems.
- B. When the backflow preventer is located on the discharge side of the pump, the pressures must be considered. System pressure at maximum churn condition may not exceed pressure rating of the backflow preventer.

6.8 Forward Flow Test Connections

- A. Forward flow test connections are required to verify that the backflow prevention assembly can provide the minimum required flow rate (system demand and hose stream allowance). The test connection must be designed to meet the system demand and discharge water directly outdoors

through a test header. A fire pump test header can be used as a forward flow test connection. Specifically, there must be one 2 ½ inch connection for every 250 gpm of system demand.

6.9 Pressure Reducing Valves

- A. PRVs may only be installed where permitted by NFPA 24.
- B. PRVs shall be installed on individual services rather than on the main piping.

7 FIRE EXTINGUISHING SYSTEMS

7.1 Design Criteria

- A. All new construction and remodeling projects shall include the installation of automatic sprinkler systems throughout the entire project area.
- B. Quick response sprinklers of ordinary temperature rating shall be provided throughout all occupancies unless otherwise required to be standard response or high temperature in accordance with NFPA 13.
- C. Written permission from the CC FCFPE is required for the use of special suppression systems, including preaction or clean agent systems unless required by this document.
- D. Where public or private water distribution networks are used as water supplies for sprinkler systems, the basis of design must be a water flow test conducted within the last year.
- E. The minimum sprinkler system design criteria shall be in accordance with the table below as minimum criteria. This table is based off the FM Global requirements in Data Sheet 3-26 (updated in March 2010). A reduction in the design area for use of quick response sprinklers is not permitted.

Table 7.1

Hospital Area	Sprinkler Design Density	Hose Allowance
Patient Rooms Corridors & Waiting Areas Emergency / Exam Rooms Cafeteria / Restaurants Seating Areas	0.10 gpm per sq. ft. over a design area of 1,500 sq. ft.	250 gpm
Kitchen / Food Preparation Large Auditoriums Areas Linen Storage Areas Mercantile Areas / Gift Shops Pharmacy Areas Diagnostic Equipment Areas (<i>Cat Scan, X-ray, MRI etc.</i>) Laboratories (<i>no significant amounts of flammable liquids/gases</i>)	0.20 gpm per sq. ft. over a design area of 2,500 sq. ft.	250 gpm

Cleveland Clinic Design Standards
 FIRE PROTECTION AND LIFE SAFETY

Hospital Area	Sprinkler Design Density	Hose Allowance
Laboratories (<i>with significant amounts of flammable liquids/gases</i>)	0.30 gpm per sq. ft. over a design area of 3,000 sq. ft.	500 gpm
Power Houses, Utilities areas, Mechanical Equipment Rooms	0.20 gpm per sq. ft. over a design area of 2,500 sq. ft.	500 gpm
Emergency Generator Rooms	0.25 gpm per sq. ft. over the entire sq. ft. of room area	500 gpm
Central Storage Areas	Design density is dependent upon storage arrangement and storage heights.	500 gpm
Enclosed Parking Garage Areas	0.15 gpm per sq. ft. over a design area of 3,500 sq. ft.	500 gpm

Note: The last revision of this table was on January 14, 2011.

7.2 Zoning Requirements

- A. Sprinkler zoning should correspond to smoke zones for health care and ambulatory health care occupancies.
- B. At a minimum, each floor shall be a separate zone, but not less than the minimum number of zones per the health care and business occupancy requirements.
- C. The size of the sprinkler zone may not exceed 22,500 square feet, except for light hazard Business Occupancies which may not exceed 52,000 square feet (NFPA 13).
- D. All sprinklers in a smoke compartment must be piped as one system with one control valve and waterflow switch. The control valve should be located inside the boundaries of that smoke zone. All sprinkler zone valves shall be mounted at 7'6" unless otherwise approved by the CC FCFPE. The preferred location of the control valve is in the stairwell.
- E. Where floor openings are not classified as atriums, the sprinklers at the ceiling must be zoned with the lower level.
- F. Fire alarm annunciation zoning is required for health care and ambulatory care occupancies. Fire sprinkler zones must coincide with smoke zones and fire alarm notification zones.
- G. Unless otherwise required by the AHJ, the following areas should be zoned separately and provided with an isolation control valve: atriums, elevator hoistways (valve should be located on level one by the fire department access), elevator machine rooms, interstitial spaces, electrical rooms with any type of transformer (in Cleveland), high voltage electrical rooms, and rooms where power must be shunted before the application of water. The Ohio Elevator Department and the City of Cleveland require a unique shutoff valve for sprinklers in elevator pits.
- H. Sprinklers in chutes must be connected to the sprinkler system on the floor where they are located.

- I. All sprinkler system zone valves shall be provided in an accessible location above the floor with Signage & Marking in accordance with NFPA 13 and Section 7.9.

7.3 Portable Fire Extinguishers

- A. Portable fire extinguishers must be located per NFPA 10.
- B. Additional guidelines for specific areas:
 1. Corridor Intersections: There are two different options for providing extinguishers for areas with corridor intersections. See Figure 1 and 2 in Appendix A.3 for more details. Provide ABC type, 5-pound. Mount inside a fully or semi-recessed cabinet.
 2. Electrical Closet: No extinguisher is required for rooms < 200 square feet.
 3. Elevator Equipment Room: Provide ABC Dry Chemical, monoammonium phosphate type, 10-pound. Mount to the wall on Grainger back plate.
 4. Kitchen: Provide a Class K extinguisher to compliment UL 300 Fire Suppression System. Mount sign conspicuously to instruct activation of hood suppression system before using the extinguisher for cooking fires. Mount to the wall on a Grainger back plate.
 5. Laboratories (employing flammable and hazardous materials): Provide ABC 5-pound fire extinguisher. Mount to the wall on a Grainger back plate.
 6. Main Mechanical and Electrical Rooms: Provide ABC type (subject to AHJ approval). For rooms greater than 200-square feet provide a 10-pound extinguisher. Mount to the wall on a Grainger back plate.
 7. MRI/MRI Control Room: Provide a water mist non-magnetic type extinguisher. Locate in the control room and within a 75 foot radius of MRI Room.
 8. Nurse Station (health care occupancy): Provide ABC type, 5-pound. Mount inside a fully or semi-recessed cabinet. Where two nurse stations are within 30-foot travel distance, provide one extinguisher in adjoining corridor equidistant to both.
 9. Operating Room: Provide a CO2 type fire extinguisher. Mount inside a fully or semi-recessed cabinet.
 10. Paper Medical Record Room: Provide ABC 5-pound fire extinguisher in rooms greater than 200-square feet. Mount inside a fully or semi-recessed cabinet.
 11. Reception Area: Provide ABC type, 5-pound. Mount inside a fully or semi-recessed cabinet. Where area is open and other fire protection devices (exit sign, fire alarm initiation and/or notification device) are in the area, locate extinguisher on same wall in proximity to other devices.
 12. Storage Room: Provide ABC type. For rooms with areas exceeding 200-

square feet provide a 5-pound or 10-pound extinguisher. Mount to the wall on a Grainger back plate.




13. Technology Rooms

MDF and Computer Rooms: Provide a water mist extinguisher for rooms greater than 200-square feet. Mount to the wall on a Grainger back plate.

IDF/IC Room: Provide ABC type, 5-pound for rooms greater than 200-square feet. Mount to the wall on a Grainger back plate.

- C. Provide the following fire extinguisher manufacturers and models:
1. CO2 fire extinguisher (5 lb.): Badger Model #B5V
 2. ABC dry chemical fire extinguisher (5 lb.): Badger Model #5MB-6H
 3. ABC dry chemical fire extinguisher (10 lb.): Badger Model #10MB-8H
 4. Non-ferrous or non-magnetic extinguishers (for MRI areas): Amerex Water Mist model #B270NM.
- D. Locate extinguishers such that they are conspicuous and within line-of-sight. Where possible, coordinate extinguisher locations with other devices, such as hose connections and fire alarm devices.
- E. Based on gross square feet of building space, one fire extinguisher must be placed for each 3,000 square feet (i.e. area of 40,000 square feet would require 13 fire extinguishers $40,000/3,000 = 13.33$ rounded off to the nearest whole number). Additional fire extinguishers may be required due to specific target areas or AHJ requirements.
- F. Fire extinguisher cabinets located in behavioral health and holding areas must be equipped with a key lock assembly.
- G. Fire extinguisher cabinets shall be fire rated where installed in fire rated construction.
- H. For extinguishers 40 pounds or less, install it so the top of the extinguisher is no more than 5 feet above the floor. The bottom of the extinguisher must be at least 4 inches from the floor.
- I. A CC EHS FPE must assign and/or approve all extinguisher locations in coordination with the CC Director of Planning and Design.
- J. Drawing Requirements:
1. Locate fire extinguishers on the Life Safety Drawings.
 2. All extinguishers must be included on the Life Safety Drawings whether in cabinets or bracket mounted.
 3. Extinguishers should be shown in blue on a separate layer.
 4. Symbols: Use NFPA-170, Table 6.9 "Symbols for Portable Fire Extinguishers." The table below shows the symbols for the most

commonly used extinguishers. Use a subscript to differentiate between cabinet and wall-mounted extinguishers. Use “SR” subscript for semi-recessed and “W” for wall-mounted. No subscript denotes fully-recessed.

Symbol	Description	Comments
	Dry Chemical Extinguisher	ABC type
	CO ₂ Extinguisher	
	Water Mist	non-magnetic

7.4 Fire Extinguisher Cabinets

- A. Fire extinguisher cabinets shall be one of the following models:
 1. Larsen stainless steel fire extinguisher cabinet model # SS-2409-SM or equivalent for 5-pound CO₂ fire extinguisher.
 2. Larsen white steel fire extinguisher cabinet model # 2409-6R or equivalent for 5-pound ABC fire extinguisher. Solid door, rolled edge, 2-1/2" semi recessed. Embossed handle with the word "FIRE" in red.
 3. Larsen clear anodized aluminum surface mounted fire extinguisher cabinet model # AL 2409-SM or equivalent, for use with ABC fire extinguishers in weather applications, such as garages.
 4. Larsen white steel fire extinguisher cabinet model #2712-RK or equivalent for water mist fire extinguisher. Full glass door, rolled edge, 1-1/4" semi-recessed. Embossed handle with the word "FIRE" in red.
- B. Specific details on fire extinguisher cabinets may change based on Larsen information. A CC EHS FPE must approve all fire extinguisher cabinets.
- C. Wall mounted fire extinguishers shall be mounted on a Grainger, red/white, polystyrene plastic, 29"X13", back plate.
- D. Refer to Section 7.9, *Signage & Valve Marking*, for signage requirements.

7.5 Standpipes and Fire Hose Connections

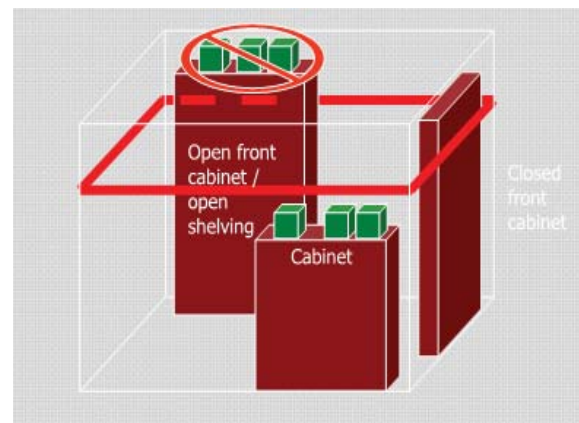
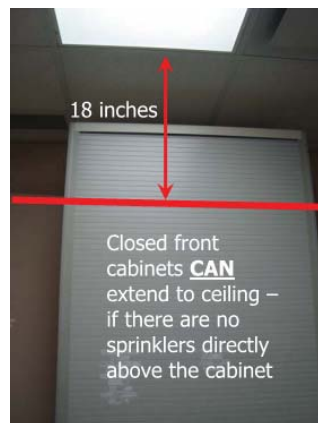
- A. All standpipe systems must be Class I.
 1. High-rise buildings must be equipped with automatic standpipe systems.
 2. Buildings other than high-rise may have manual standpipe systems (for example, dry standpipes in garages).
- B. Class I systems must be provided with 2 ½ inch hose connections in the locations required by the building code and AHJ. Locations must be approved by the local fire department.

1. The Cleveland Fire Department requires hose connections on the stair landing. Verify with the fire department.
- C. Provide a minimum 3 feet of clearance in front of all standpipe hose connections.
- D. Hose connections and hose stations must be unobstructed and must be located not less than 3 feet or more than 5 feet above the floor per NFPA 14.
- E. Where possible, provide combination standpipe and sprinkler risers.
- F. Dry standpipes are only permitted in spaces subject to freezing.
- G. The minimum standpipe size is 4 inches for hydraulically calculated systems per NFPA 14.
- H. Fire hose connections in stairwells shall have a chrome finish.
- I. Standpipes shall be painted red. Approval from the CC FCFPE is required to paint the standpipe a color other than red.

7.6 Sprinkler Systems

- A. General
 1. All project areas must be fully sprinkler protected in accordance with NFPA 13, unless written approval is received from the CC FCFPE.
 2. Sprinklers may not be omitted from electrical rooms.
 3. Interstitial spaces must be fully sprinkler protected.
 4. Sprinklers are not required to be installed in freestanding portable wardrobe units used as a closet to store clothing and other resident personal belongings.
 5. Sprinklers for canopies shall be reviewed on a case by case basis by the CC FCFPE.
 6. Cleveland Elevator Department does not permit sprinklers to be installed in elevator shafts or machine rooms. Sprinklers may be installed in elevator pits.
7. Rubbish and Linen Chutes
 - a. Gravity chutes shall be protected internally by automatic sprinklers. A sprinkler shall be installed at or above the top service opening of the chute and at the lowest service level. In addition, a sprinkler shall be installed within the chute at alternate floor levels in buildings over two stories in height.
 - b. Automatic sprinklers installed in gravity chute service openings shall be recessed out of the chute area through which the material travels.
 - c. Concealed automatic sprinklers shall be installed in chute terminal rooms and access rooms.

8. In remodeled areas where quick-response sprinklers are being installed, existing sprinklers in the fire compartment in light hazard areas must be replaced if they are not quick-response sprinklers.
9. In areas with ceilings, provide flat-plate concealed standard coverage spray pendent sprinkler heads.
10. In areas without ceilings, provide standard coverage spray upright sprinkler heads.
11. Sprinkler design must consider floating ceilings and other obstructions per the requirements of NFPA 13.
12. UL listed guards are required for sprinklers that are subject to mechanical damage or those installed less than 6 feet 8 inches above the finished floor, except in IT rooms (see Section 4.5).
13. Closed front cabinets can extend to ceiling if there are no sprinklers directly above the cabinet. Storage above 18 inches from the ceiling is not permitted on top of closed-front cabinets.



14. Determine if patient lift equipment tracks in the ceiling are obstructions to sprinkler discharge in accordance with NFPA 13. Special escutcheon plates can be added to the sprinkler piping to provide a properly installed pendant sprinkler that hangs 4 inches off the ceiling.
15. Determine the range of movement for equipment booms to verify that there will be no sprinkler obstructions.
16. All combustible concealed spaces must be equipped with automatic sprinklers.
17. In existing facilities where new ceilings are installed below existing combustible ceiling tiles and adhesive, including low-density cellulose ceilings, combustible products must be removed before new ceilings are installed.

B. Wet-Pipe

1. System shall be hydraulically calculated in accordance with NFPA 13. Pipe schedule systems are not permitted for new building construction. For renovation projects, pipe schedule may be used with approval from the CC FCFPE.
2. Provide a flow switch testing device for each sprinkler zone.
3. Provide non-ferrous piping and sprinklers for all areas within Magnetic Resonance Imaging (MRI) suites.
4. Provide wet pipe sprinkler protection in all electrical and IT spaces, except as required by Section 4.5.
5. Provide institution-style sprinklers in behavioral health and holding areas.
6. CPVC sprinkler piping is not permitted without the approval of the CC FCFPE.
7. Antifreeze systems are not permitted without the approval of the CC FCFPE. Only factory premixed propylene glycol or glycerin antifreeze solutions are permitted at the lowest possible concentrations required to prevent freezing.

C. Dry-Pipe

1. Only use dry pipe systems in areas subject to freezing.
2. Use Schedule 40 piping. To minimize corrosion, use galvanized steel with cut-grooved couplings. The technical data for the galvanization process must be provided to the CC FCFPE for review and approval.
3. All piping shall be pitched to a drain or riser.

D. Preaction

1. Written permission from the CC FCFPE is required for the use of pre-action systems, unless required in this document.
2. Preaction systems must be used for MDF and Computer Rooms greater than 200 square feet, switch gear rooms, and generator rooms.
3. Detection mechanism shall be approved by the CC Fire and Life Safety Manager.
4. Use Schedule 40 piping. To minimize corrosion, use galvanized steel with cut-grooved couplings. The technical data for the galvanization process must be provided to the CC FCFPE for review and approval.
5. All piping shall be pitched to a drain or riser.

7.7 Supplemental Suppression Systems for Special Hazards

A. General

1. Special hazard suppression systems are not a substitute for required automatic sprinkler systems. Written permission from the CC FCFPE is required for the use of special hazard suppression systems.

2. Provide a stand-alone control/releasing panel for any special hazard suppression system, which shall activate the building fire alarm system in the event of operation.
3. Detectors used for releasing special hazard supplemental suppression systems must be tied to the control/releasing panel.
4. Panel location and required power must be coordinated with the electrical contractor.

7.8 Extinguishing Systems for Cooking Facilities and Equipment

- A. Extinguishing systems for commercial cooking equipment shall be in accordance with NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*, and NFPA 17A, *Standard for Wet Chemical Extinguishing Systems*.
- B. Protection of food preparation facilities shall not be required where domestic cooking equipment is used for food warming or limited cooking (microwave ovens, hot plates, toaster, and nourishment centers).

7.9 Signage & Valve Marking

- A. Fire extinguisher cabinets (semi-recessed):
 1. Sides - Horizontally layered on each side, 1-1/8" "FIRE EXTINGUISHER", with 2 inch icon of extinguisher.
 2. Front - Icon of extinguisher shall be placed at lower left corner of cabinet door. Size of icon must be 4 inches.



- B. Fire extinguisher cabinets (fully-recessed):
 1. Horizontally layered label, 1-1/8" "FIRE EXTINGUISHER", with 2" icon of extinguisher, placed at the lower left corner of the cabinet door, if the door is not already marked. This will be a rare exception, such as an Operating Room application. Additional wall signage will be required for spotting in such cases.
- C. If extinguishers are not within the line-of-sight, a red perpendicular must be provided to indicate location. Refer to the picture below and Figure 2 in Appendix A.3.



D. Concealed shut off valves:

1. Red label triangles (3" equilateral) must be placed on the nearest wall to the valve with the apex pointing toward the ceiling tile. Refer to picture below.



2. Circle dots (1" diameter) must be placed strategically on border framing of ceiling tile. Refer to picture below.



8 FIRE ALARM

8.1 General Requirements

- A. Fire alarm systems must be installed in all facilities. Systems must have emergency voice communication capability; except that non-coded analog/addressable systems may be provided in business or ambulatory health care occupancies with a total calculated occupant load less than 100 occupants.

8.2 Initiation

A. Smoke Detectors

1. Provide smoke detectors as required by the applicable codes, standards, and this document. CC requires smoke detectors in the following locations:
 - a. IDF/IC Technology Rooms
 - b. MDF and Computer Rooms
 - c. Within 5 feet of normally held-open cross-corridor smoke and fire doors, as required by NFPA 72 based on the depth of the wall section above the door. Non cross-corridor smoke and fire doors may be released by a water flow switch, pull station, or general area smoke detector in the associated zone.
 - d. Private and semi-private patient sleeping rooms require smoke detectors and swing free door closers for the doors to these patient rooms. The CC Fire and Life Safety Manager can provide details.
 - e. Areas required for Phase I elevator recall
 - f. In areas that are not continuously occupied, provide automatic smoke detection at the location of each fire alarm control unit, notification appliance circuit power extender, and supervising station transmitting equipment.
 - g. In health care occupancies, alcoves and other areas permitted to be open to the corridor
2. All spot type smoke detectors must be photoelectric type. Alarm verification may not be used for smoke detectors installed for the purpose of early warning or as otherwise prohibited by codes and standards.
3. If approved by the CC FCFPE, projected beam smoke detectors may be provided. Where provided, these detectors must be designed and installed in accordance with the manufacturer's recommendations, including both mandatory and advisory portions. Stratification and access for cleaning, testing, and maintenance must be considered. Backup documentation may be required by the CC FCFPE or AHJ.
4. Smoke detectors must be installed at least 3 feet from air diffusers and



5. Smoke detectors must be spaced in accordance with NFPA 72 and manufacturer's specifications. Refer to NFPA 72 Annex B for design criteria for unique spaces, including those with ceilings higher than 16 feet.

B. Smoke Alarms

1. Provide sounder base smoke alarms and strobes in each on-call room. The smoke alarms are provided for the sole purpose of notifying the occupants of the presence of smoke within that room.

C. Duct Smoke Detectors

1. Duct smoke detectors must be provided for mechanical unit shutdown as required by NFPA 90A. Where a duct smoke detector is installed in an inaccessible or difficult to reach location, provide a remote indicating lamp and a test key switch on the ceiling or adjacent wall in a location approved by the CC FCFPE. See the following picture for an example.



2. Duct smoke detectors must be provided for smoke dampers as required by NFPA 90A.
3. Duct detectors from prepackaged air handler units may not be used.

D. Heat Detectors

1. Heat detectors must be installed within 2 feet of each sprinkler installed in elevator machine rooms and hoistways, with the exception of sprinklers installed in the elevator pit. The detector must have lower temperature and higher sensitivity rating than the sprinklers.

Note: Cleveland Elevator Department prohibits the installation of sprinklers in elevator shafts and elevator machine rooms. Sprinklers may be installed in elevator pits. Heat detectors are not required where sprinklers are not provided.

E. Manual Stations

1. Manual pull stations shall be provided in all occupancies. All manual stations must be double-action break glass type.
2. Provide manual pull stations for each exit at the grade level and at stair enclosure exits on each floor on the corridor or room side, located not more than 5 feet from the door. Additional pull stations must be provided adjacent to the nurse's stations in health care occupancies and adjacent to reception desks that are not close to a code required manual pull station. The travel distance to any station from any point in the building must not exceed 200 feet in any occupancy. Pull stations in behavioral health and holding areas should be located at the nurse's station under supervision and inside the fire exit stair, which is always locked.

F. Waterflow Devices

1. Activation of the initiating device shall occur within 90 seconds of water flow at the alarm-initiating device when flow occurs that is equal to or

greater than that from a single sprinkler of the smallest orifice size installed in the system.

2. Waterflow switches associated with the elevator machine room and hoistway must activate immediately without time delay.

Note: Cleveland Elevator Department prohibits the installation of sprinklers in elevator shafts and elevator machine rooms. Sprinklers may be installed in elevator pits.

8.3 Occupant Notification

A. Public/Private Mode

1. Private operating mode may be used for alarm notification in health care occupancies. Private operating mode is defined by NFPA 72 as audible or visible signaling only to those persons directly concerned with the implementation and direction of emergency action initiation and procedure in the area protected by the fire alarm system.
2. Public operating mode must be used for alarm notification in non-health care occupancies.

B. Audible Notification

1. Audible notification appliances must be installed in all locations throughout the protected premises from where staff must respond, including nursing ward areas in health care facilities. Do not locate audible notification appliances in surgical operating rooms and critical care patient areas.
2. Where voice notification is not provided, speakers producing the temporal three tone must be used. Quantity and locations must be sufficient to meet audibility requirements of NFPA 72. Do not provide speakers in elevator cabs or stairwells.
3. Speakers must be installed in sufficient quantities to provide an intelligibility score of 0.7 on the CIS scale. Preferred installation is multi-watt speakers at ¼ watt tap. Ceiling-mounted speakers are preferred. Speakers must be provided in stairwells and elevator cabs for the purpose of live voice announcements only and must not activate upon activation of the fire alarm signal.
4. Consult with the CC FCFPE for the standard voice messages based on the occupancy and evacuation scheme for the building. Contact the CC FCFPE to determine voice messages for each zone. All fire alarm voice messages must be approved by the CC FCFPE. Template for health care voice message is as follows:

After a brief set of march time tones, a voice message will be sounded: "Attention, attention, Code Red Team report to (note building name here) Level (note floor here) (note location of fire alarm LCD annunciator)."

5. Where audible appliances are installed to provide signals for sleeping areas, they must be installed to provide a sound level at the pillow of the greatest of the following scenarios:
 - a. At least 15 dB above the average ambient sound level
 - b. 5 dB above the maximum sound level having a duration of at least 60 seconds
 - c. 75 dBA
 6. Water flow switches shall activate a local alarm bell.
- C. Visual Notification
1. Visible notification appliances must be located in all public accessible areas including corridors, auditoriums, cafeterias, conference rooms, retail stores, open office areas, and similar spaces. Visual notification appliances shall be located in all restrooms.
 2. Visible notification appliances are not required in the following areas, except where that space is designated as ADA compliant on the architectural plans:
 - a. Individual office spaces
 - b. Closets
 - c. Utility shafts
 - d. Crawl spaces
 - e. Normally unoccupied rooms less than 100 square feet
 - f. Normally unoccupied storage spaces
 - g. Stairway enclosure and elevators
 - h. Neonatal intensive care units, surgical operating rooms, procedure rooms, and non-ADA patient sleeping rooms
 3. Visual appliances shall have a xenon strobe.

8.4 Emergency Control Functions and Interfaces

- A. Elevator Recall & Power Shunt (where provided)
- B. Door Release
- C. Door Unlocking
- D. HVAC Shutdown
- E. Smoke Control

8.5 Circuits and Pathways

- A. General
 1. With the exception of network connections, all fire alarm system wiring

must be solid copper. All conductors which are terminated, spliced or otherwise interrupted must be connected to terminal blocks. All connections must be made with pressure type terminal blocks.

- B. Performance of circuits for local building fire alarm systems must be specified as defined in NFPA 72 as follows:
 - 1. Initiating Device Circuits (IDC): Class A
 - 2. Signaling Line Circuits (SLC): Class A.
 - 3. Notification Appliance circuits (NAC): Class A
 - 4. Network Connections: Class A
- C. Survivability
 - 1. All fire alarm system wiring must be installed in rigid metal conduit or electrical metallic tubing. In buildings employing relocation or partial evacuation, pathways must have a 2-hour fire rating in accordance with NFPA 72.

8.6 Control Panels

- A. Locate all fire alarm control equipment in year-round conditioned spaces that are accessible with a general building maintenance key. This generally excludes vestibules and mechanical/server rooms that are keyed separately.
- B. Main Control Panel: The location of the main control panel must be shown on the first drawing submittal and approved by the CC FCFPE and local authorities having jurisdiction no later than the second drawing submittal. The preferred location is the main security office.
- C. Remote Control Panels: Indicate the location of remote control panels on drawings and coordinate space and power requirements with the electrical engineer. Remote panels must be capable of local, standalone operation in case of loss of signal from the main control panel. Networked control panels in separate buildings must have the capability to deliver voice messages in standalone mode.
- D. Remote Annunciators: Provide a remote annunciator for fire department use. The type and location must be shown on the first drawing submittal and approved by the CC FCFPE and local authorities having jurisdiction no later than the second drawing submittal. Provide a Simplex 4603-9101 LCD annunciator or equivalent. The piezo shall be deactivated. The preferred locations are the main lobby, nursing stations, and reception areas (when there are no nursing stations). Provide textual LCD annunciators for all buildings. Textual LCD annunciators must have a minimum of two lines displayed. A PC-style graphic control station may be specified with approval from the CC FCFPE.
- E. NAC Extenders and Amplifiers: The quantity and locations of notification appliance circuit extender panels and amplifiers may be determined by the manufacturer's recommendation and the installing contractor during shop

drawing development. They may be located in electrical and/or telecommunication rooms on each floor. Power requirements for NAC extenders and amplifiers shall be coordinated with the fire alarm shop drawing submittal.

- F. Power: Coordinate the primary power for fire alarm systems with the electrical engineer. Rechargeable lead calcium or sealed lead acid type batteries must be provided at each panel with sufficient capacity to operate the fire alarm system in accordance with the secondary power requirements of NFPA 72.
- G. Smoke Control Panel: Indicate the location of control panel on the drawings and coordinate space and power requirements with the electrical engineer. Coordinate approval of location, control features, and annunciation jointly with CC and the AHJ.
- H. Graphic FACP: Indicate the location of the graphic FACP on the drawings and coordinate space and power requirements with the electrical engineer. The location of the Graphic FACP must be shown on the first drawing submittal and approved by the CC FCFPE no later than the second drawing submittal.

8.7 Supervision, Annunciation, and Reporting

- A. Supervision: Provide electrical supervision by the fire alarm system for each sprinkler/standpipe control valve. For each fire pump, provide individual supervision of the following alarms: fire pump running, fire pump loss of power in any phase, fire pump phase reversal, fire pump fail to start, fire pump connected to emergency power, and other annunciation as required by NFPA 20. Also include supervision for preaction panels, fixed suppression panels, compressor power failure for dry pipe and preaction systems, low air for dry pipe and preaction systems. Consider supervision for low temperature (for fire pump rooms and water tanks), low fuel alarms (where diesel fire pumps are installed), and other design features where provided.
- B. Annunciation Zoning: Each initiating device must have its own address describing the device type, location, and area served. Where smoke zones are provided, sprinkler systems must be zoned per smoke zone. Address description for any initiating device located within a smoke zone must include corresponding smoke zone.
- C. Annunciation: All alarm, supervisory and trouble signals must be annunciated at the main control panel, remote annunciator, and central station by means of audible and visible indicators. Annunciation at remote control panels is not required.
- D. Reporting: All fire alarm systems installed in CC facilities are required to report to a supervising station. Connection for buildings on the main campus must be via fiber optic network. Buildings off-campus must be connected to a central receiving station for fire alarms via DACT.

- E. Emergency Forces Notification: The supervising station must be responsible for notifying the fire department of a fire event in buildings that are located on the main CC campus.

8.8 Sequence of Operations

- A. See Appendix A for an example sequence of operation matrix for general systems and zoned systems. The FPE is responsible for preparing the sequence of operations for the fire alarm system for each project.

8.9 Fire Command Center

- A. A fire command center must be provided where required by the building code or NFPA 101 (as well as in any facility greater than 100,000 SF that utilizes zoned or defend-in-place evacuation schemes).
- B. The room must comply with the requirements of the building code and NFPA 101.
- C. Size the emergency command center to accommodate a work table and chair.
- D. A waterproof box for building floor plans shall be provided in the fire command center.
- E. The location of the fire command center must be indicated on the first drawing submittal and approved jointly by the CC FCFPE and local fire department no later than the second drawing submittal.

8.10 Signage

- A. Duct detectors:
 - 1. Mark the ceiling tiles with red (1" dots) to indicate location of duct. Refer to picture below.



9 VENTILATION

9.1 Air Duct Accessories (fire and smoke dampers)

- A. Smoke Dampers
 - 1. For health care occupancies, NFPA 101 does not require smoke dampers

in duct penetrations of smoke barriers in fully ducted heating, ventilating, and air-conditioning systems (smoke compartments adjacent to the smoke barrier must be sprinklered). Local building codes may require smoke dampers. In those cases, the dampers need to be provided even though NFPA 101 lists an exception.

2. Smoke dampers shall be provided as required by NFPA 90A. Smoke dampers must be installed in air handler systems that have a capacity greater than 15,000 cubic feet per minute. The following are exceptions to this smoke damper requirement for air handler units:
 - a. Air handlers that are located on the floor they serve and only serve that floor
 - b. Air handlers mounted on the roof serving only the floor immediately below the roof
- B. Fire Dampers
1. Fire dampers must be provided in the following locations:
 - a. Air ducts that penetrate walls with a fire resistance rating of 2 hours or more
 - b. Air ducts that penetrate any fire-rated vertical shaft
 - c. All air transfer openings in partitions that are required to have a fire resistance rating
 2. Air ducts that pass through the floors of buildings that require the protection of vertical openings must be enclosed with partitions or walls constructed of materials as permitted by the building code. Where an air duct penetrates only one floor, or one floor and an air-handling equipment penthouse floor, and the air duct contains a fire damper located where the duct penetrates the floor, an air duct enclosure is not required.
- C. Combination fire/smoke dampers
1. Per the applicable building code, shaft enclosures that are permitted to be penetrated by ducts and air transfer openings shall be protected with approved fire and smoke dampers installed in accordance with their listing, unless the building code provides an exception.

9.2 Ductwork Smoke Detection

- A. Heating, ventilating, and air-conditioning systems must be fully ducted.
- B. Where duct detectors are used to initiate the operation of smoke dampers, they should be located so that the detector is between the last inlet or outlet upstream of the damper and the first inlet or outlet downstream of the damper. Install duct detector within 5 feet of the damper. In order to obtain a representative sample, areas where stratification can occur and dead air space should be avoided. Such conditions could be caused by return duct

openings, sharp turns, or connections, as well as by long, uninterrupted straight runs.

- C. Where in-duct smoke detectors are installed in concealed locations more than 10 feet above the finished floor or in arrangements where the detector's alarm or supervisory indicator is not visible to responding personnel, the detectors must be provided with a remote indicating lamp and a test key switch on the ceiling or adjacent wall in a location approved by the CC FCFPE.
- D. More than one detector is required when the dimensions of the duct exceed 36 inches for the width or depth. Refer to NFPA 72 for details.
- E. In Cleveland, duct smoke detectors must provide a supervisory signal. In off campus locations, duct smoke detectors shall active the fire alarm unless approved by the AHJ to be supervisory.
- F. Ducts must not penetrate exit enclosures unless they provide the exit enclosure with independent pressurization.

APPENDIX A

APPLICABLE DESIGN AND CONSTRUCTION CRITERIA

A.1 Master Specifications

Design Standard Reference	Spec Section	Spec Section Title	Spec Section Description
7.6 Sprinkler Systems 7.5 Standpipes and Fire Hose Connections	211313	Automatic Sprinkler and Standpipe Systems	Piping, specialties, valves, and sprinklers for wet/dry-pipe sprinkler systems. Standpipe piping, specialties, valves, hose valves, and hose stations.

A.2 Plan Review Checklists

Fire Alarm Plans Review Checklist - Health Care Occupancy

DATE REVIEWED: BLDG:

PROJECT NAME: FLOOR:

Fire Alarm System		YES	NO	NA	DEFICIENCIES
Primary and Secondary Power	Circuit dedication to power source. Circuit mechanically protected.				
Circuits	Initiating (IDC), Notification(NAC) and Signaling(SLC). Type Class A.				
Applicable Codes	CCF Design Standard,NFPA 70&72 LSC (2000) and applicable references.				
Detection/Notification/Initiating	Type of Smoke Detector, Pull Station Placement, Audible Signaling Controls. Smoke detectors placed 30 ft on center.				
Auxilliary Controls	Fire/Smoke Damper Fan Control, Flow/TamperSwitches.				
Fire Alarm Control Panel	Location of all FACP, annunciator panels, and digital communicators.				
Installation and Design					
	All points on the ceiling shall have a detector within a distance equal to .7 times the selected spacing.				
	Spot type detectors shall be located on the ceiling not less than four inches from a side wall or, if mounted on a side wall, between four and twelve inches down from the ceiling to the top of the detector.				
Smoke Detectors					
	Spot type detectors should be mounted at least 6' from florescent lights.				
	Spacing of 30 feet may be used as a guide, consult manufacturers instructions. If 30 feet is used as a guide, any square that will fit inside of a circle with a 21 foot radius could be covered with a single smoke detector. Note that an area 10 ft. by 41ft. can be covered by one smoke detector using 30 ft. spacing.				
	Solid joists shall be considered equivalent to beams for smoke detector placement.				
	Smoke Detector placement shall be located 3 ft (36") from air diffuser.				
Heat Detectors					
	Heat detectors are not considered life safety equipment, they are for property only.				
	The maximum ceiling temperature in the area where the heat detector is installed must be 20 degrees or more below the operating temperature of the heat detector.				

Cleveland Clinic Design Standards
 FIRE PROTECTION AND LIFE SAFETY

Fire Alarm System		YES	NO	NA	DEFICIENCIES
Pull Stations					
	The operable part of the pull station must be mounted between 3.5 feet and 4.5 feet from the floor.				
	Pull stations should be located within 5 feet of each egress door on each floor.				
	In addition, there should not be more than 200 feet of travel distance between pull stations when required throughout a building.				
	Manual pull stations are required to be red in color.				
	These devices are required to be marked with the word "FIRE" to indicate the purpose of the manual station.				
Audible and Visual Notification Devices					
	Generally, notification is considered as horns, bells and strobes. However, notification also includes voice evacuation systems, alarm printers, annunciators, textual displays and graphic displays.				
	The sound level is required to be at least 15 dBA above the average or normal sound level or 5 dBA above the maximum sound level that lasts at least one minute.				
	This measurement is required to be 5 feet (1.5 M) off of the floor.				
	The measurement in sleeping areas is required to be measured at the pillow level. Each installation is individual and will require specific evaluation.				
	Strobe requirements of the ADA apply to new construction or renovations to portions of buildings open to the general public.				
	When strobes are required, the installation, operation and location requirements are the same for ADA and the NFPA.				
	Visual appliances are installed in one of two orientations, wall mount and ceiling mount.				
	Flashing strobes are listed for a particular orientation and are required to be installed in that orientation. Wall mount strobes cannot be mounted on ceilings for visual notification.				
	The spacing requirements for the visual devices are based on the tables in NFPA 72. The spacing is based on the square area covered by a single device.				
	Visual devices mounted on walls, the strobe configuration is either a single device per area, two devices per area, or four devices per area.				
	The largest room area covered by a single wall mounted device is 70 feet by 70 feet.				
	The maximum ceiling height of any ceiling mounted strobe is 30 feet. If the ceiling height exceeds 30 feet, the visual devices must be suspended or wall mount strobes must be used. The maximum room area covered by a ceiling mounted strobe is 50 feet by 50 feet.				

Life Safety Plans Review Checklist - Health Care Occupancy

DATE REVIEWED:

BLDG:

PROJECT NAME:

FLOOR:

DESCRIPTION/REQUIREMENT	LSC 2000	BUILDING CODE	YES	NO	NA	DEFICIENCIES
PDF Drawings						
Provide color PDF drawings to Cleveland Clinic at the bid, middle, and as built phases.						
Number of Exits & Exit Travel Distances						
At least two (2) exits are provided on each floor?	18.2.4.1					
Exits are remote per "1/3 diagonal rule?"	7.5.1.4					
Travel distance to exit does not exceed 200 ft?	18.2.6.2.2					
Travel distance from room door to exit does not exceed 150 ft?	18.2.6.2.1					
Smoke compartments have at least two (2) exits?	18.2.4.3					
Smoke compartment exits are remote per "1/3 diagonal rule?"	7.5.1.4					
Travel distance to smoke barrier doors does not exceed 200 ft?	18.3.7.1(4)					
Dead-end corridors do not exceed 20 ft?		x				
Horizontal Exits						
Horizontal exits are used only if the total egress capacity of other exits is not reduced below 1/3?	18.2.2.5.2					
Are constructed as 2-hour barriers?	7.2.4.3.1					
The 2-hour barrier is continuous from ground level to deck (unless Exception to 7.2.4.3.1 is met?)	7.2.4.3.1					
An approved vision panel shall be required in each horizontal exit door. Center mullions are prohibited in horizontal exit door openings.	18.2.2.6					
Where horizontal exits are used in the means of egress they shall conform to the general requirements of Section 7.1 and the requirements of 7.2.4	7.2.4.1.1					

Cleveland Clinic Design Standards
 FIRE PROTECTION AND LIFE SAFETY

DESCRIPTION/REQUIREMENT	LSC 2000	BUILDING CODE	YES	NO	NA	DEFICIENCIES
Door Locking						
Doors in the required means of egress are not locked?	18.2.2.2.4					
If "clinical needs" of patients requires doors to be locked, staff can unlock doors at all times?	18.2.2.2.4					
If "clinical needs" require locked doors, indicate how doors will be able to be unlocked at all times (keyed-alike, remote control of locks, etc.)?	18.2.2.2.5					
Delayed Egress Locks						
Delayed egress hardware will be used on egress doors? If YES, list exact locations.	7.2.1.6.1					
Doors with delayed egress will unlock upon sprinkler activation or smoke detector?	7.2.1.6.1(a)					
Doors with delayed egress will unlock upon loss of power?	7.2.1.6.1(b)					
Doors with delayed egress will unlock within 15 sec of pressing the release device?	7.2.1.6.1(c)					
Doors with delayed egress will sound an audible alarm within 3 seconds of pressing the release device?	7.2.1.6.1(c)					
Doors with delayed egress have a sign indicating "Push Until Alarm Sounds, Door Can Be Opened In 15 Seconds?"	7.2.1.6.1(d)					
Areas having doors with delayed egress are provided with emergency lighting?	7.9.1.1(4)					
Access Control Locks						
Locks, Latches, and Alarm devices shall conform to LSC 2000.	7.2.1.5.1					
Doors have a clear width of at least 41.5" ?	18.2.3.5					
Where permitted in Chapter 11 thru 42 doors in the means of egress shall be permitted to be equipped with an approved entrance and egress access control.	7.2.1.6.2					
Occupant Load						
The total capacity of the means of egress for any story, balcony, tier or other occupied space shall be sufficient for the occupant load thereof.	7.3.1.1					
Exterior exit discharge shall be provided with sufficient illumination of exit discharge.						

Fire Suppression Plans Review Checklist - Health Care Occupancy

DATE REVIEWED: BLDG:

PROJECT NAME: FLOOR:

DESCRIPTION/REQUIREMENT		YES	NO	NA	DEFICIENCIES
Fire Suppression System (Wet)					
Water Supply	Hydraulic Calculation and System Demand, Existing Water Supply adequate for sprinkler application.				
System Design Type	Note type of design criteria Pipe Schedule Method/Area Density Method.				
Temperture Rating	135 to 170 Degree Ordinary Temperature Rating or to fit application.				
Sprinkler Spacing	Sprinkler Spacing 6 ft. on center 4 inches from wall. Density K factor to match nominal 5.6				
FM Guidelines	FM Guidelines will be as used on FM driven Projects Density 0.10 per sq ft over a minimum design area of 1,500 square feet. Where applicable, Hospital Areas designated density 0.10 to 0.30. Refer to design standards for details.				
Fire Suppression (Dry)					
Size of System	Not more than 1000 auto sprinklers shall be controlled by any one dry valve.				
Sprinkler Riser	750 gallon limit per dry valve installation.				
Sprinkler Type	Only upright sprinklers will be installed (heated return bends).				
Supervision	Sprinkler piping and fire detection devices shall be supervised.				
Water Supply	System shall deliver water within 60 seconds of Dry Valve trip (Inspector Test).				
Sprinkler Spacing	Spacing of detectors/sprinklers listed manufacturer's requirements.				
Both Systems					
Spare Sprinklers	The minimum number of spare sprinklers: *Facilities with less than 300 sprinklers: at least 6 spare sprinklers *Facilities with 300-1000 sprinklers: at least 12 spare sprinklers *Facilities with over 1000 sprinklers: at least 24 spare sprinklers A minimum of 2 sprinklers of each type and temperature rating.				
Sprinkler Shut-Off Tool	Provide a sprinkler shut off tool for each type of head provided.				
Escutcheon Plates	Escutcheon Plates (spare) shall be 10% of total and located in Spare Head Cabinet.				
Obstruction to Discharge	Automatic Sprinklers shall not be obstructed by piping, insulation & devices.				
Caution Signs	Caution Signs shall be attached to all valves controlling sprinklers.				
Control	Each system of outside sprinklers shall have an independent control valve.				
Use of Sprinklers	Upright sprinklers shall be installed with the frame arms parallel to the branch line.				

A.3 Fire Extinguishers in Corridors

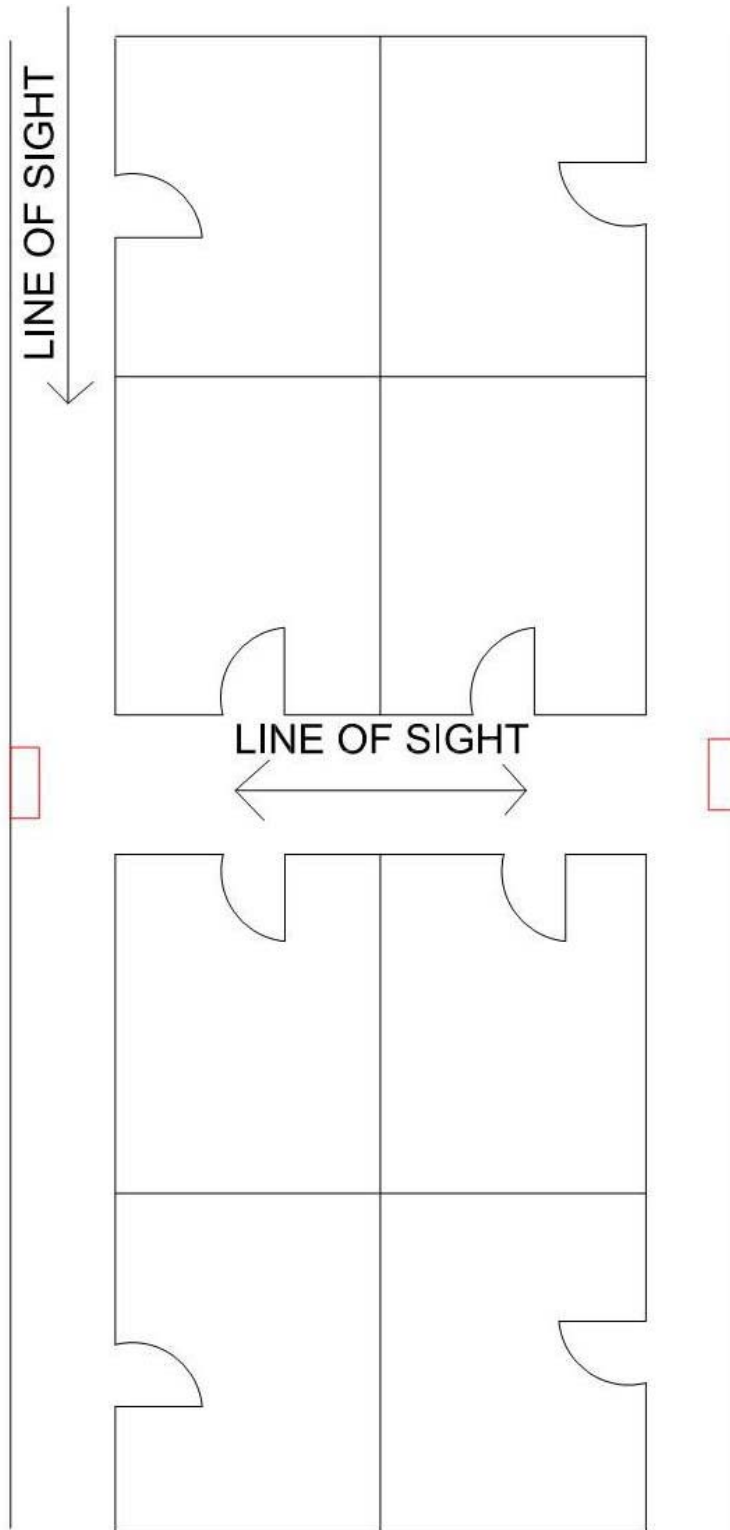


FIGURE 1

 FIRE EXTINGUISHER

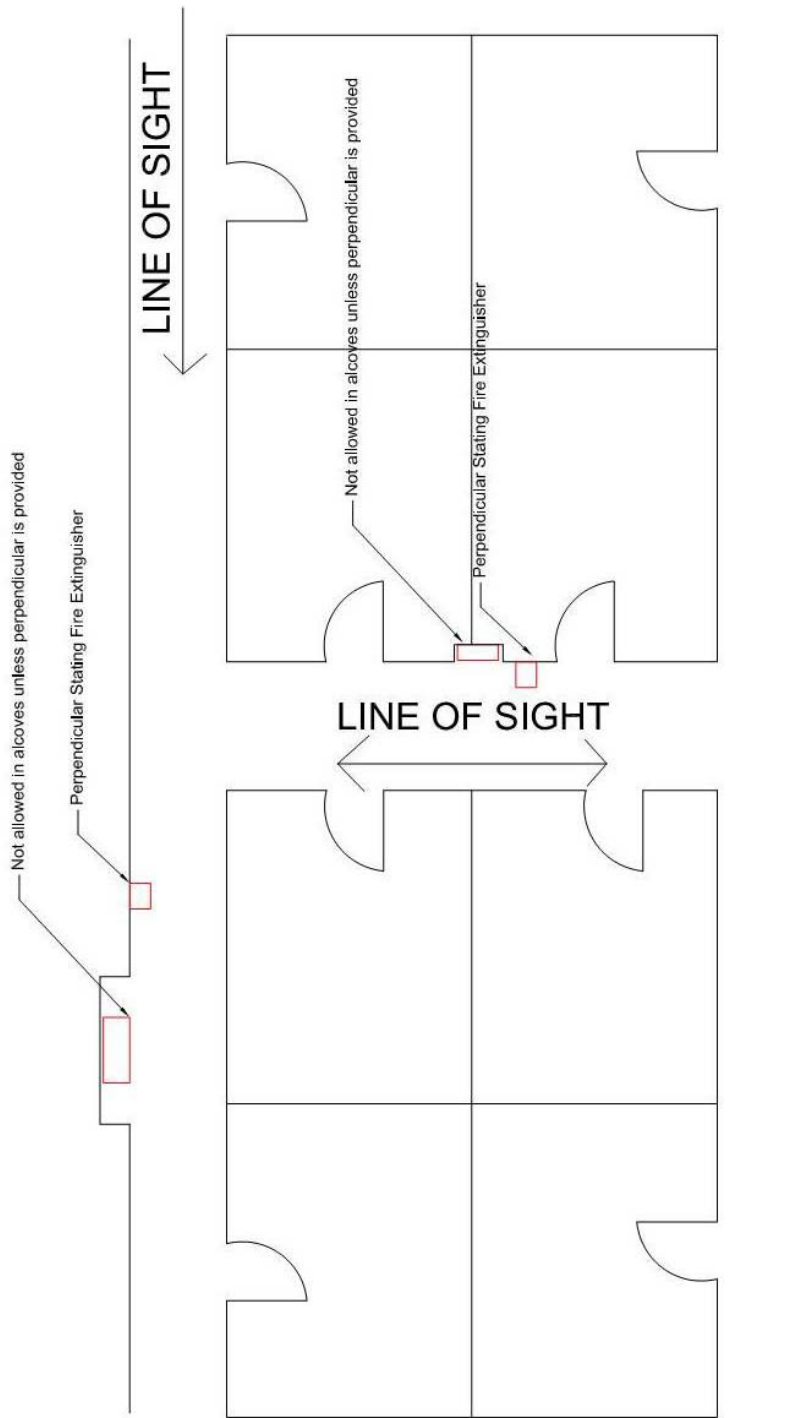


FIGURE 2

□ FIRE EXTINGUISHER

A.4 Sequence of Operations

Sequence of Operations Matrix for In-patient Health Care

SYSTEM INPUTS	SYSTEM OUTPUTS																				
	ANNUNCIATION				EMERGENCY FORCES NOTIFICATION			OCCUPANT NOTIFICATION			AUXILIARY FUNCTIONS										
	Audio-Visual Fire Alarm Indication at FACP and Remote Annunciator	Audio-Visual Supervisory Signal at FACP and Remote Annunciator	Audio-Visual Trouble Indication at FACP and Remote Annunciator	Transmit Fire Alarm Signal to Central Station or Proprietary Station	Transmit Supervisory Signal to Central Station or Proprietary Station	Transmit Supervisory Waterflow Signal to Central Station	Transmit Trouble Signal to Central Station	Activate Audible Notification Appliances in the Building with Pre-Recorded Fire Emergency Announcement	Activate Visual Notification Appliances in the Building	Activate Audible Notification in On-call Room	Close Associated Door	Close All Magnetically Held Doors in Smoke Zone if Provided	Transmit Door Unlock Signal to Security Panel for the Building	Shut Down Affected Air Handler	Close Associated Smoke Dampers	Initiate Elevator Recall	Initiate Elevator Shut Down and Disconnect Elevator Power	Disconnect Fuel Source from Associated Cooking Equipment	Silence Fire Alarm Notification for Duration of Announcement	Silence Music and other Non-emergency Announcements	Activate Local Alarm Bell
Fire Detection																					
Duct Smoke Detector		•			•								•	•							
Area Smoke Detector	•				•			•	•												
Patient Room Smoke Detector	•				•			•	•	•											
On-call Room Smoke Detector	•				•			•	•	•											
Door Release Smoke Detector	•				•			•	•	•											
Elevator Lobby, Hoistway, Machine Room Smoke Detector	•				•			•	•						•						
Elevator Shaft or Machine Room Heat Detector	•				•			•	•							•					
Manual Pull Station	•				•			•	•												
Fire Suppression																					
Water Flow/Pressure Switch	•				•			•	•			•	•								•
Elevator Hoistway or Machine Room Water Flow Switch	•				•			•	•			•	•			•					
Control Valve Tamper Switch		•																			
High/Low Air Pressure Switch		•																			
Kitchen Hood Suppression System	•				•												•				
Fire Pumps																					
Pump Running		•				•															
Fail to Start		•				•															
Phase Reversal		•				•															
Selector Switch Not in Automatic		•				•															
Engine Over-speed (diesel)		•				•															
Low Fuel (diesel)		•				•															
Low Battery (diesel)		•				•															
Engine Trouble (diesel)		•				•															
Emergency Communication System																					
Live Voice Announcement																			•	•	
System Integrity																					
Open Circuit			•					•													
Ground Fault			•					•													
Fire Alarm AC Power Failure			•					•													
Fire Alarm System Low Battery			•					•													