Welcome
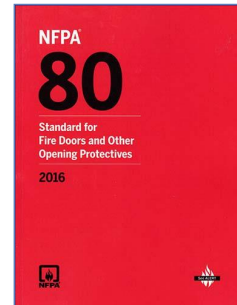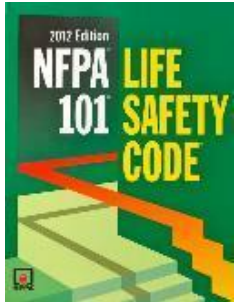
USING BIM (Building Information Modeling) To Help Achieve Operational Safety In Complex Networks Of Building Management Systems (BMS)

ANSI
American National Standards Institute

BSI British Standards
Code of practice for fire safety in the design, management and use of buildings

2012 Edition
NFPA 101 LIFE SAFETY CODE

NFPA 80
Standard for Fire Doors and Other Opening Protectives
2016

Design
Build
Maintain

BIM

dormakaba

Active and Passive Fire Protections Systems.

Detection

Suppression

Active Components (Need trigger)

Containment

Fire walls

FW   FW

FW   FW

Fire floors

FF   FF

FF   FF

FF   FF
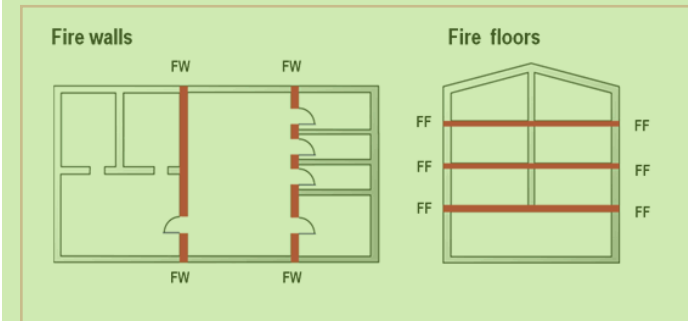
Passive Components (Always there)

Active Fire Protection

Is a group of systems that require some amount of action in order to work efficiently in the event of a fire. (Fire extinguisher, Sprinkler etc.)
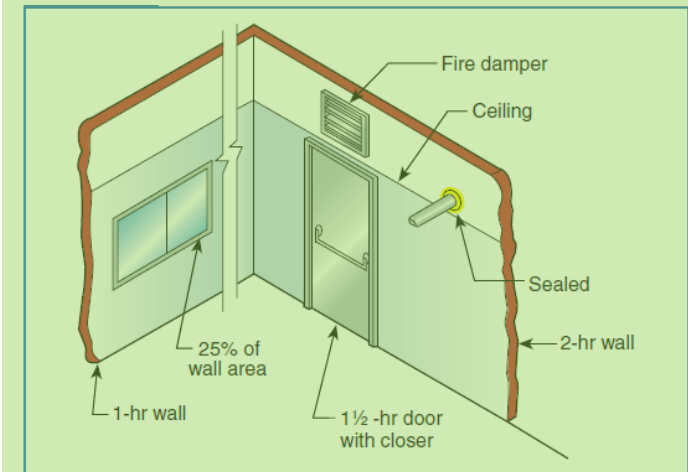
Passive Fire Protection

Is a group of systems that compartmentalize a building through the use of fire-resistance rated walls and floors, keeping the fire from spreading quickly and providing time to escape for people in the building. (Dampers, Fire Doors, Fire Sealants)

- Fire damper
- Ceiling
- Sealed
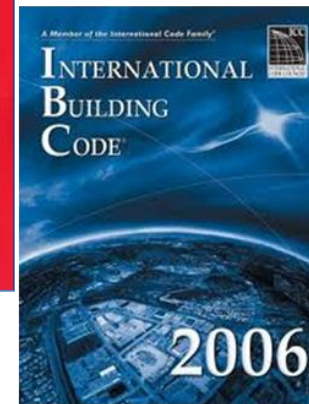- 2-hr wall
- 25% of wall area
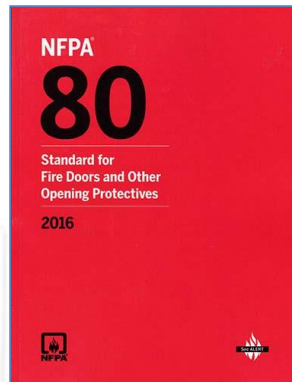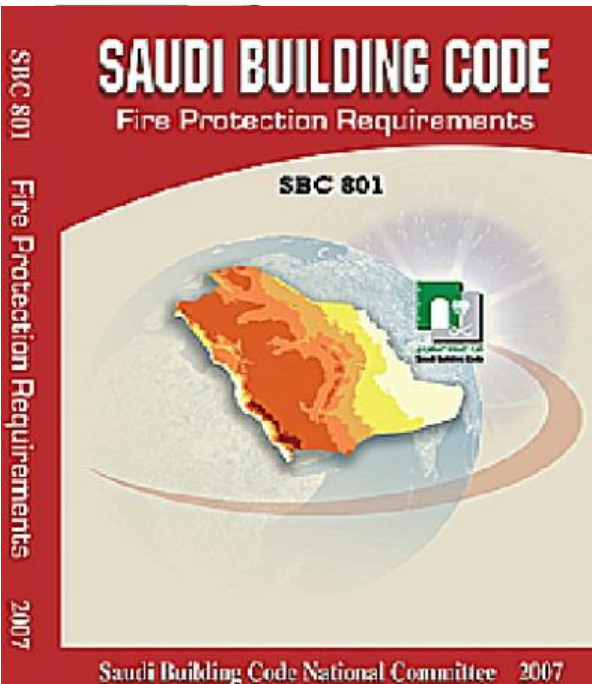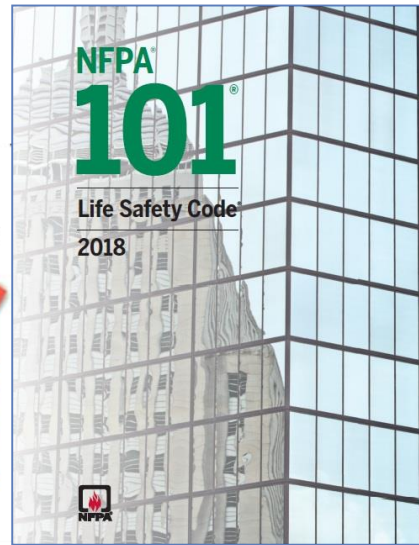- 1-hr wall
- 1½ -hr door with closer

Typical penetrations of a fire barrier.

Integration of **Passive Fire Safety Code Requirements** in Building Design using BIM

Global Codes and Standards

■ Codes and standards establish the <u>minimum</u> <u>criteria</u> for meeting levels of construction, performance or quality of a product or process.


SBC 801: Fire Protection Requirements
SBC 201: Architectural Requirements

dormakaba

Global Codes and Standards

In the event of fire or other emergency, occupants must be able to vacate a building or space quickly.

Architects incorporate certain elements into their buildings that provide a protected path of travel from any point inside the building to a safe place outside or inside the building.
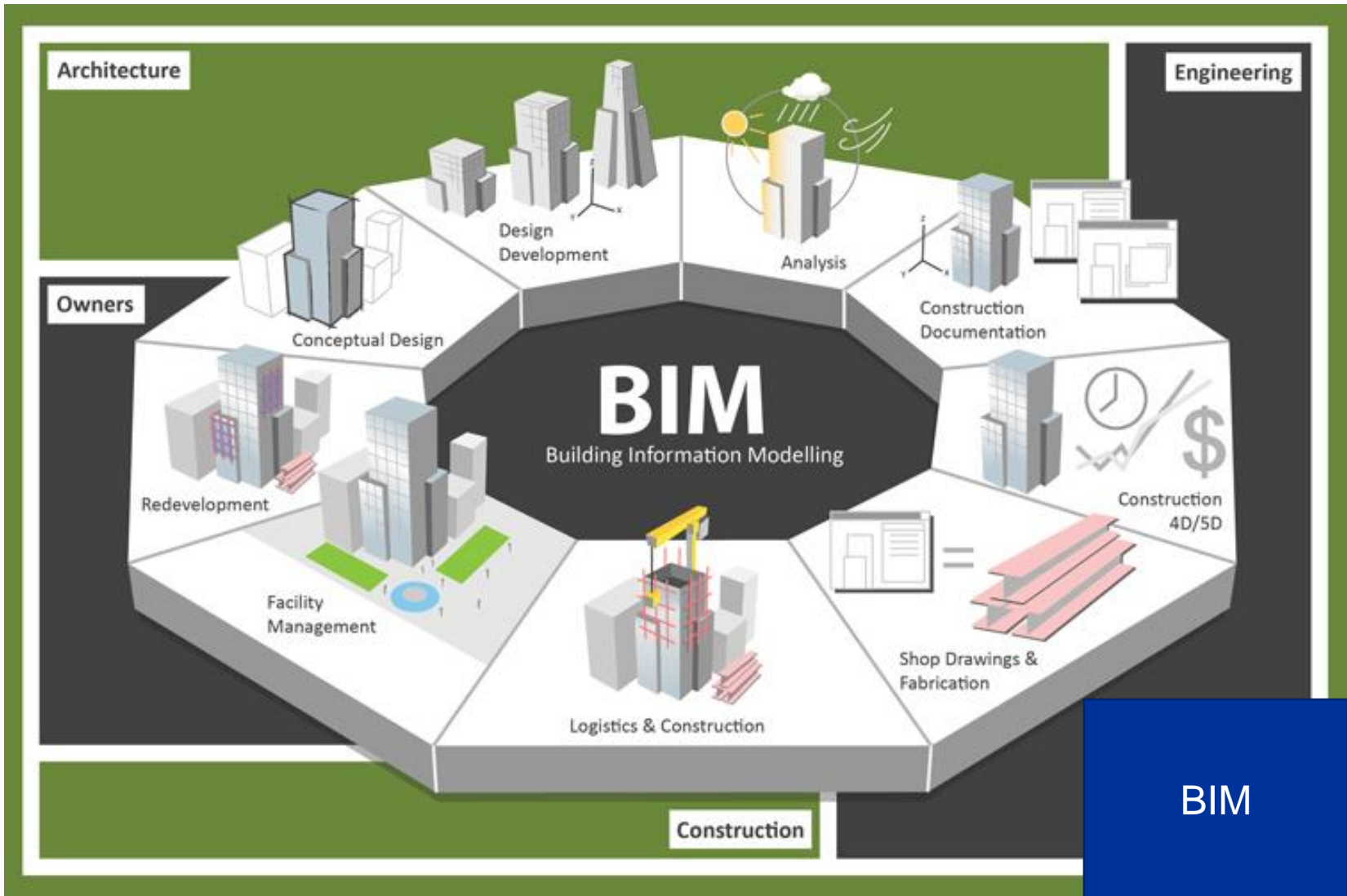
BIM

BIM Definition

- A 3D model of building ✗

- A software. ✗

- Building Information Management ✗

- Building Information Model ✗

BIM Definition

- A 3D model of building ✗
- A software. ✗
- Building Information Management ✗
- Building Information Modeling ✓

BIM Definition

- A 3D model of building ✗

- A software. ✗

- Building Information Management ✗

- Building Information Modeling ✓

Several Software support BIM:

- Revit

- ArchiCAD,

- Bentley Architecture,

- IDEA Architectural

and several others.

dormakaba

BIM Definition

There are many definitions of BIM. Some say BIM is a type of software, some say BIM is a 3D virtual model of the building while others refer to it as a process.

	BIM (Building Information Modelling) Definition	*Source*
1	BIM is construction of a **model** that contains the **information** about a building from all phases of the building life cycle	ISO 16757-1: 20151
2	BIM is discrete set of electronic object-oriented **information** used for design, construction and operation of a built asset	PAS 1192-5:20152
3	BIM is a digital representation of the physical and functional characteristics of a building over its life cycle	BS 8536:20103
4	BIM is a **rich information model**, consisting of potentially multiple data sources, elements of which can be shared across all stakeholders and be maintained across the life of a building from inception to recycling	National Building Specification (NBS)4
5	BIM is a Shared digital representation of **physical and functional characteristics** of any built object (including buildings, bridges, roads, etc.) which forms a reliable basis for decisions.	BS ISO 29481-1 20105
6	BIM is the development and use of a multi-faceted computer software **data model** to not only document a building design, but to simulate the construction and operation of a new capital facility or a recapitalized (modernized) facility	General Services Administration (GSA)6
7	BIM is a digital representation of **physical and functional characteristics** of a facility. As such it serves as a shared knowledge resource for **information** about a facility forming a reliable basis for decisions during its lifecycle from inception onward	National Institute of Building Science (NIBS)7
8	BIM is digital representation of **physical and functional characteristics** of a facility creating a shared knowledge resource for **information** about it forming a reliable basis for decisions during its life cycle, from earliest conception to demolition	RIBA, CPIC
9	BIM is a process that involves creating and using an intelligent 3D **model** to **inform** and communicate project decisions. Design, visualisation, simulation and collaboration enabled by Autodesk BIM solutions provide greater clarity for all stakeholders across the project lifecycle. BIM makes it easier to achieve project and business goals.	Autodesk

BIM Definition

B**I**M → VR, AR, MR . . . .

MR is the merging of real and <u>virtual worlds</u> to produce new environments and visualizations where physical and digital objects co-exist and interact in real time
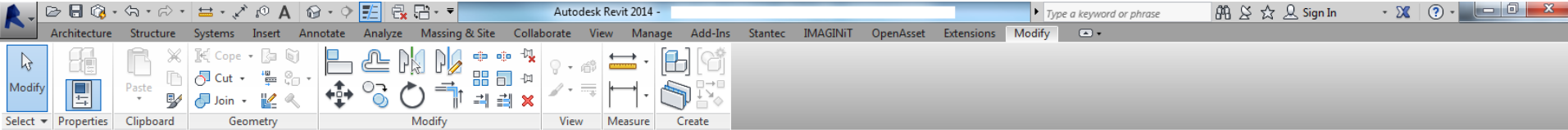
dormakaba

BIM – Products

Codes & Standards Requirements!

Intelligent Revit Content

2D Technical Drawings

Specifications

Scheduling & Management

3D Model Visualisation

Documentation

Architects & Designers

Engineers

Builders & Contractors

Facilities Management & Owners

Building Product

Who Uses it?

Building Products in BIM

BIM – Products

Properties ×

DOOR_DR_01
DCT_D1_01

Doors (1) | Edit Type

Constraints	≥
Construction	≥
Text	≥
Materials and Finishes	≥
Segments and Fittings	≥
Dimensions	≥
Identity Data	≥
Phasing	≥
Model Properties	≥
General	≥
Data	≈
01_Hardware Set Number	1
Hardware 1-Qty	3
Hardware 1-Unit	Each
Hardware 1-Item	Hinges
Hardware 1-Item Code	3094-2BB
Hardware 1-Description	Hinges-101.6mmx 101.6mm ...
Hardware 1-Manufacturer	Dorma
Hardware 1-Finish	SSS.
Hardware 2-Qty	1
Hardware 2-Unit	Each
Hardware 2-Item	Lock
Hardware 2-Item Code	771 Lock
Hardware 2-Description	Mortise lock, LATCH and DE...
Hardware 2-Manufacturer	Dorma
Hardware 2-Finish	SSS
Hardware 3-Qty	1
Hardware 3-Unit	Each
Hardware 3-Item	Cylinder
Hardware 3-Item Code	Gege pExtra-DKZ
Hardware 3-Description	Europrofile Cylinder 35/35m...
Hardware 3-Manufacturer	KABA
Hardware 3-Finish	Ni
Hardware 4-Qty	1
Hardware 4-Unit	Each
Hardware 4-Item	Door Closer
Hardware 4-Item Code	ITS96-EN 2-4, HO G96N20
Hardware 4-Description	Door Closer, Concealed.-Adj...
Hardware 4-Manufacturer	Dorma

850.00   850.00

098-029
HWS- 1

43260

Project Browser

DOOR HARDWARE SPECIFICATION
Floor Plan: 00_GROUND FLOOR_HW
Floor Plan: 01_FIRST FLOOR_HW
Floor Plan: 02_SECOND FLOOR_HW
Floor Plan: 03_3RD FLOOR_HW
Floor Plan: 04_4TH FLOOR_HW
Floor Plan: 05_5TH FLOOR_HW
Floor Plan: 06_6TH FLOOR_HW
Floor Plan: 07_7TH FLOOR_HW
Floor Plan: 08_8TH FLOOR_HW
Floor Plan: 09_9TH FLOOR_HW
Floor Plan: 10_10TH FLOOR_HW
Floor Plan: 11_11TH FLOOR_HW
Floor Plan: 12_12TH FLOOR_HW
Floor Plan: 13_13TH FLOOR_HW
Floor Plan: 14_14TH FLOOR_HW
Floor Plan: 15_15TH FLOOR_HW
Floor Plan: 16_16TH FLOOR_HW
Floor Plan: BASEMENT 01_HW
Floor Plan: BASEMENT 02_HW

dormakaba

BIM – Products - Reports

Compartmentation

NFPA 101, Life Safety Code – Ch. 8, Construction and Compartmentation,
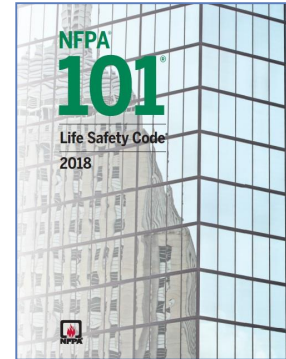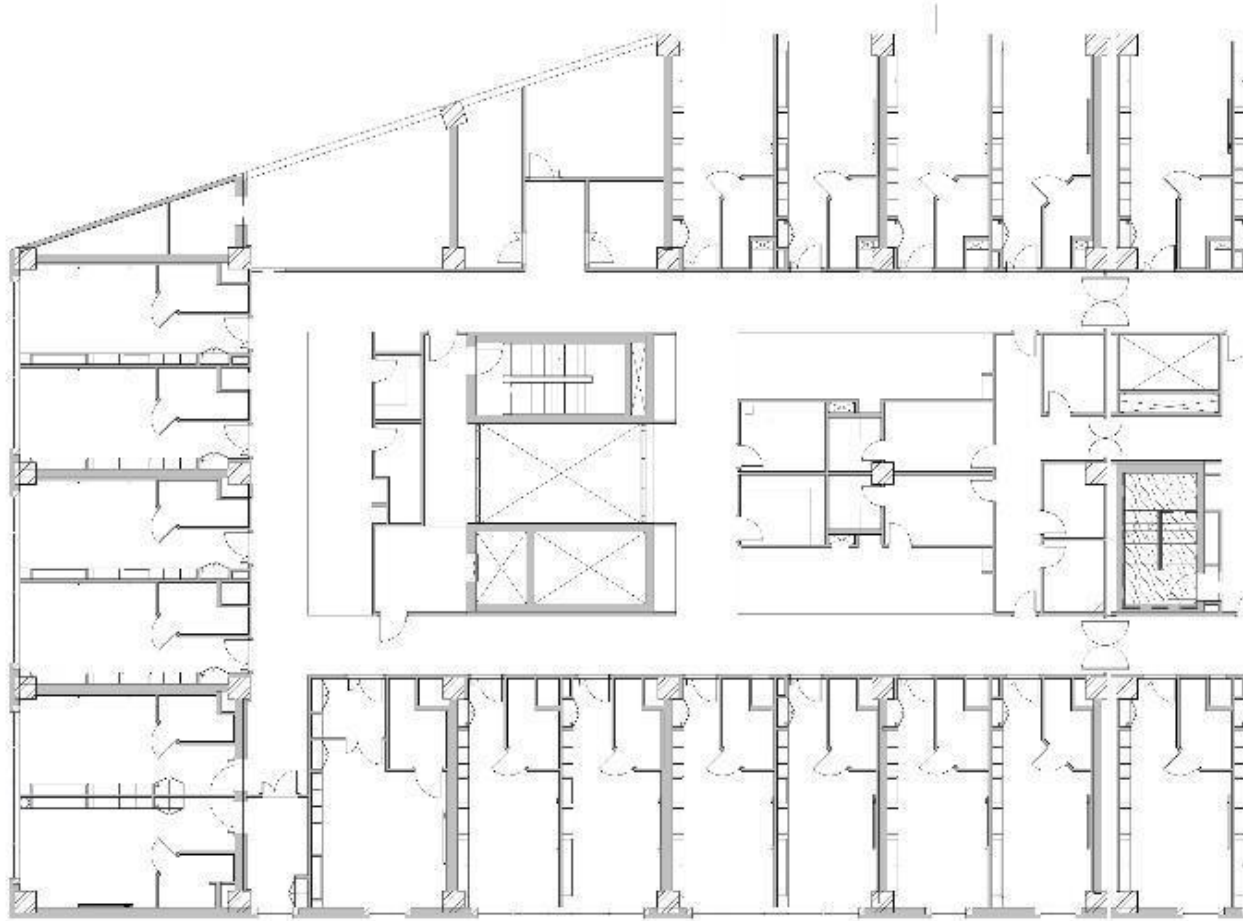8.2.2.2 Fire Compartments shall be formed with fire barriers.

Compartmentalized

Exit

Exit

Mercantile Occupancy

Business Occupancy

Fire Resistance Rated Separation Wall Between Occupancies

Exit

Non-Compartmentalized

Egress corridor system shared between occupancies

Business Occupancy

Exit

Assembly Occupancy

Exit

Mercantile Occupancy

Fire damper
Ceiling
Sealed
2-hr wall
1½ -hr door with closer

E
E

1st floor

- Hazardous content
- Occupancy separation
- Escape routes
- Vertical Openings
- Compartment Limits

To <u>Compartmentalize or not</u>, is mandatory for some occupancies by Code, while a designer's strategy for others.
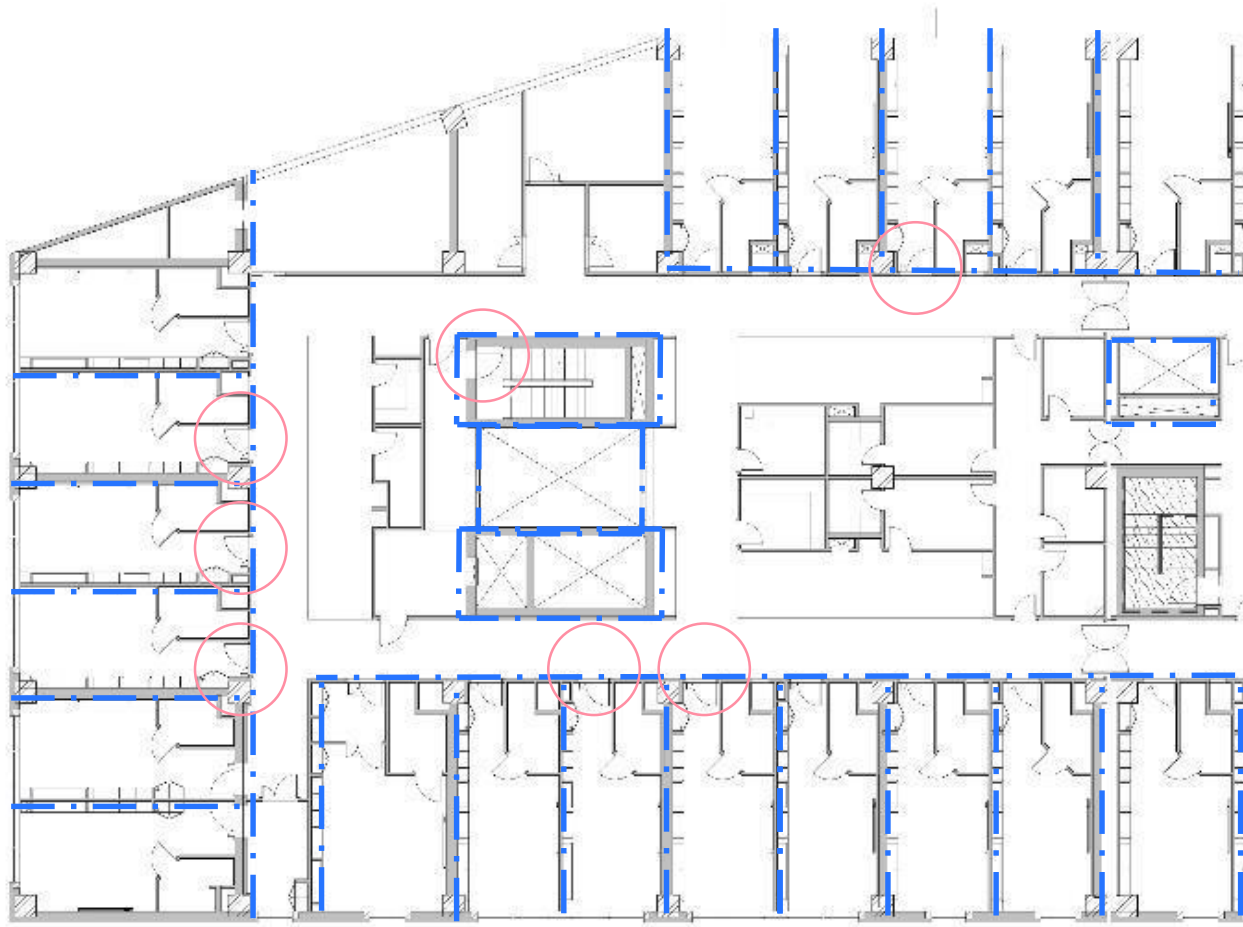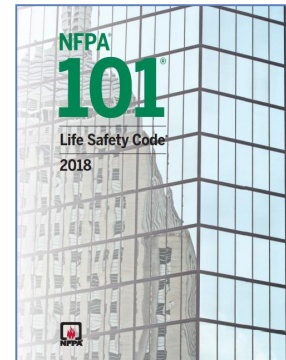
dormakaba

Compartmentation

NFPA 101, Life Safety Code – Ch. 8, Construction and Compartmentation, 8.2.2.2 Fire Compartments shall be formed with fire barriers.

Compartmentation

NFPA 101, Life Safety Code – Ch. 8, Construction and Compartmentation, 8.2.2.2 Fire Compartments shall be formed with fire barriers.

Compartmentation

Fire Rated doors to be Self Closing and Self Latching

NFPA® 80

Standard for
Fire Doors and
Other Opening Protectives

NFPA
80
Standard for
Fire Doors and Other
Opening Protectives
2016

6.1.3 Operation of Doors. All swinging doors shall be closed and latched at the time of fire.

6.1.3.2 Self-Closing Doors.

6.1.3.2.1 Self-closing doors shall swing easily and freely and shall be equipped with a closing device to cause the door to close and latch each time it is opened.

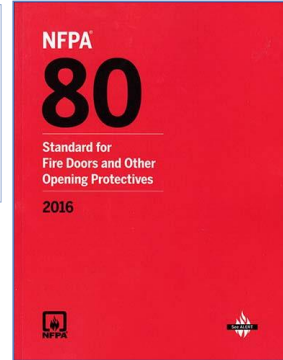**6.1.3.2.2** The closing mechanism shall not have a hold-open feature.

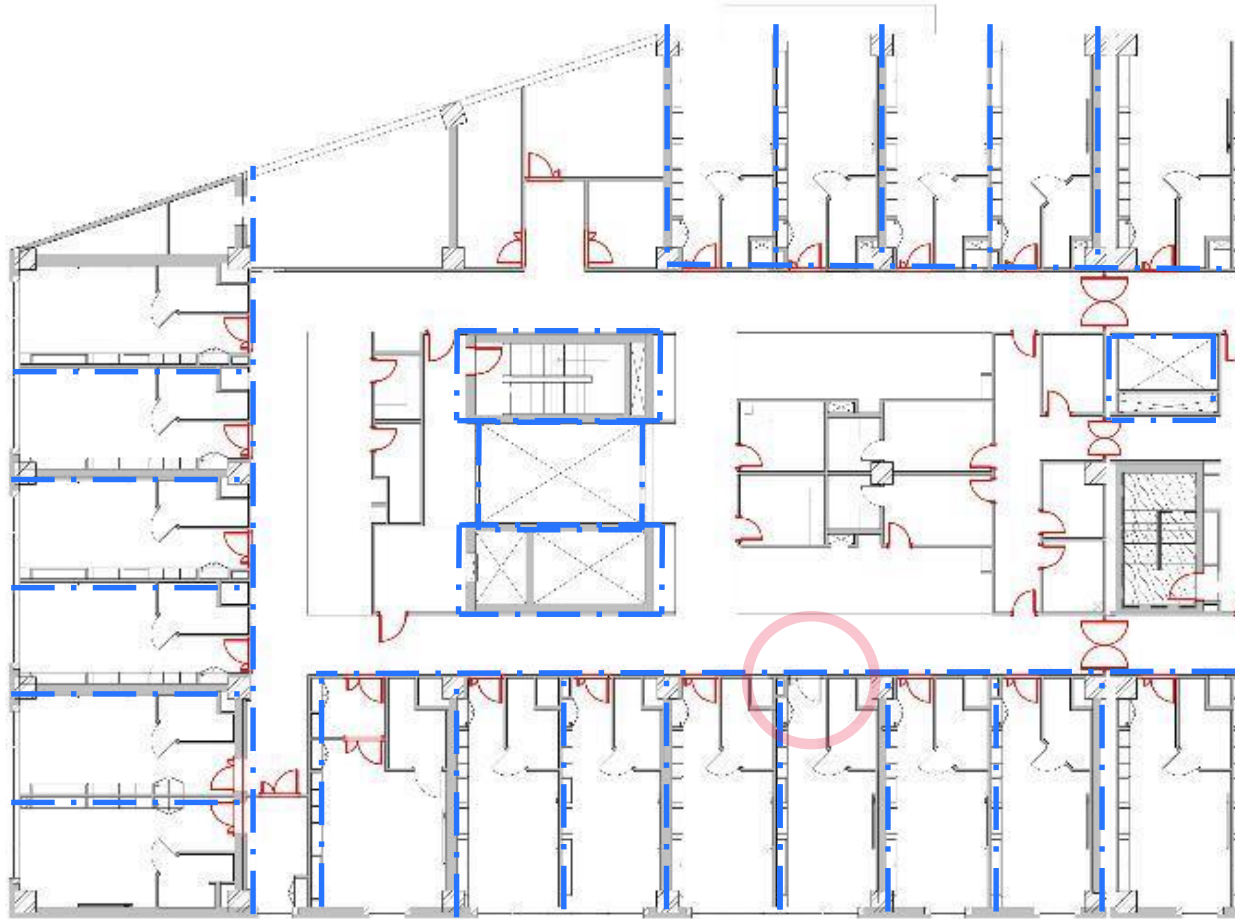Rated Door Closer   Rated Lock with Latch
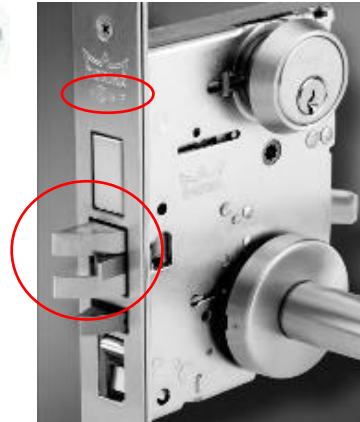
dormakaba

Compartmentation

NFPA 101, Life Safety Code – Ch. 8, Construction and Compartmentation, 8.2.2.2 Fire Compartments shall be formed with fire barriers.

NFPA
80
Standard for
Fire Doors and Other
Opening Protectives

2016

dormakaba

Occupant Load / Number of Exits

NFPA
101
Life Safety Code
2018

Occupant Load

7.3.1.1.1 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.

Number of Exits

7.4.1.2 The number of means of egress from any story or portion thereof, other than for existing buildings as permitted in Chapters 11 through 43, shall be as follows:

(1) Occupant load more than 500 but not more than 1000 — not less than 3
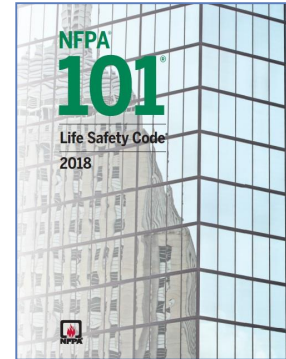
(2) Occupant load more than 1000 — not less than 4

Health Care Occupancies

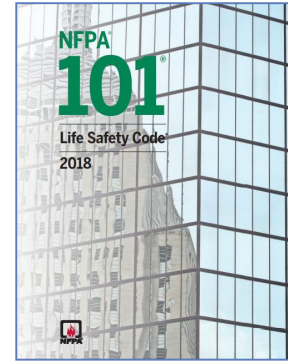**18.2.4.1** Not less than two exits shall be provided on every story.

Storage Occupancies

42.2.4.1 The number of means of egress shall comply with any of the following:

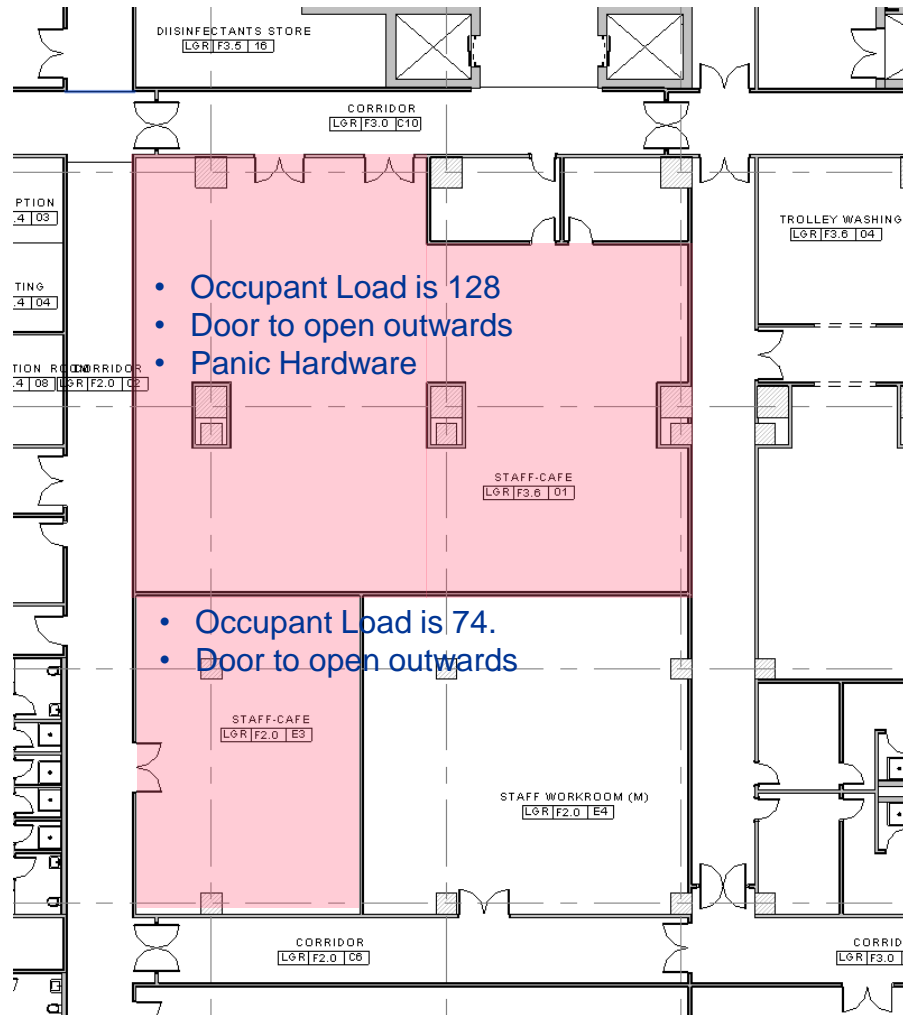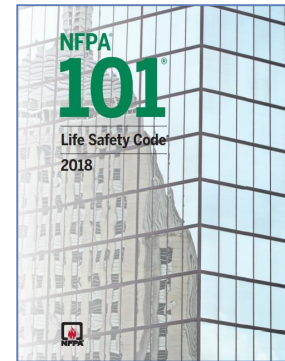(1) In low hazard storage occupancies, a single means of egress shall be permitted from any story or section.

dormakaba
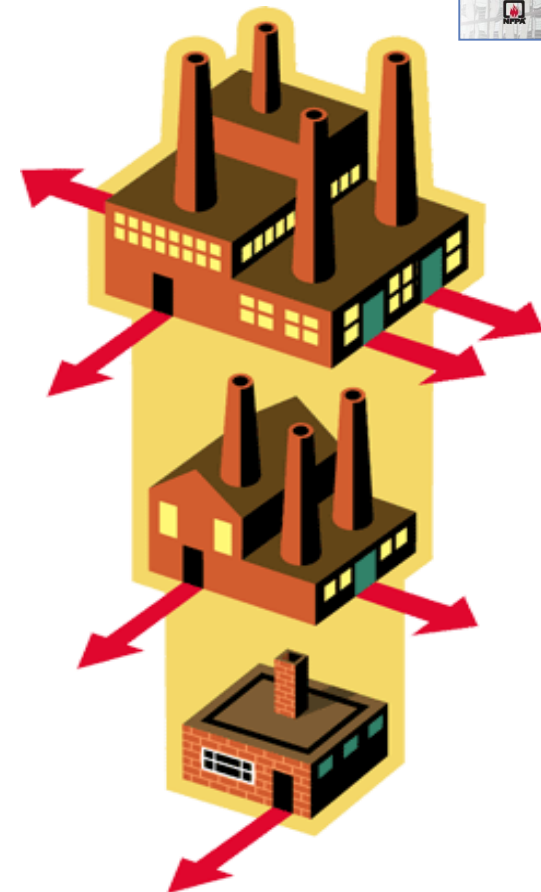
Occupant Load / Number of Exits

Code Compliance ☐

Occupant Load / Number of Exits

- Occupant Load is 128
- Door to open outwards
- Panic Hardware

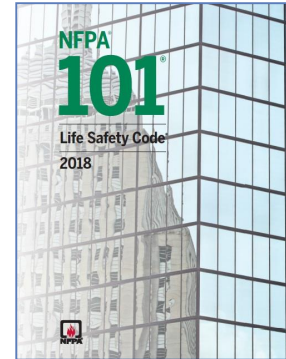- Occupant Load is 74.
- Door to open outwards

- Occupant Load
- Door to Open Outwards
- Panic Hardware
- Door Width
- Number of doors
- Location of doors
- Common Path of Travel
- Travel Distance
- Compartmentation

Code Compliance ☑

Egress
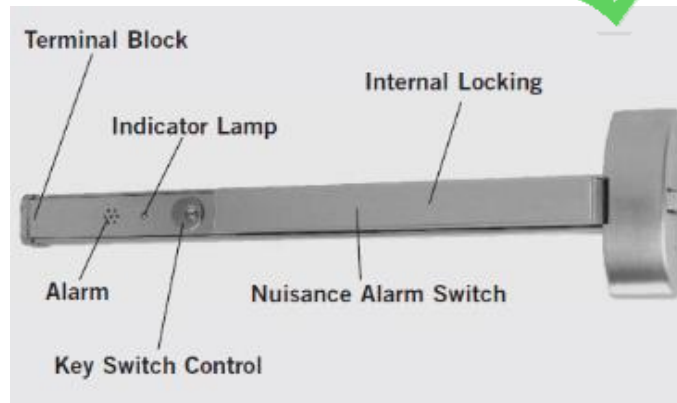
Emergency Exit/Escape doors – Swing doors

12.2.2.2.3 Any door in a required means of egress from an area having an occupant load of 100 or more persons shall be permitted to be provided with a latch or lock only if the latch or lock is panic hardware or fire exit hardware complying with 7.2.1.7, unless otherwise permitted by the following:

NFPA
101
Life Safety Code
2018

Chained Panic/Exit hardware for security.   ✗

DORMA DE9000: Delayed Egress Panic Bar   ✓
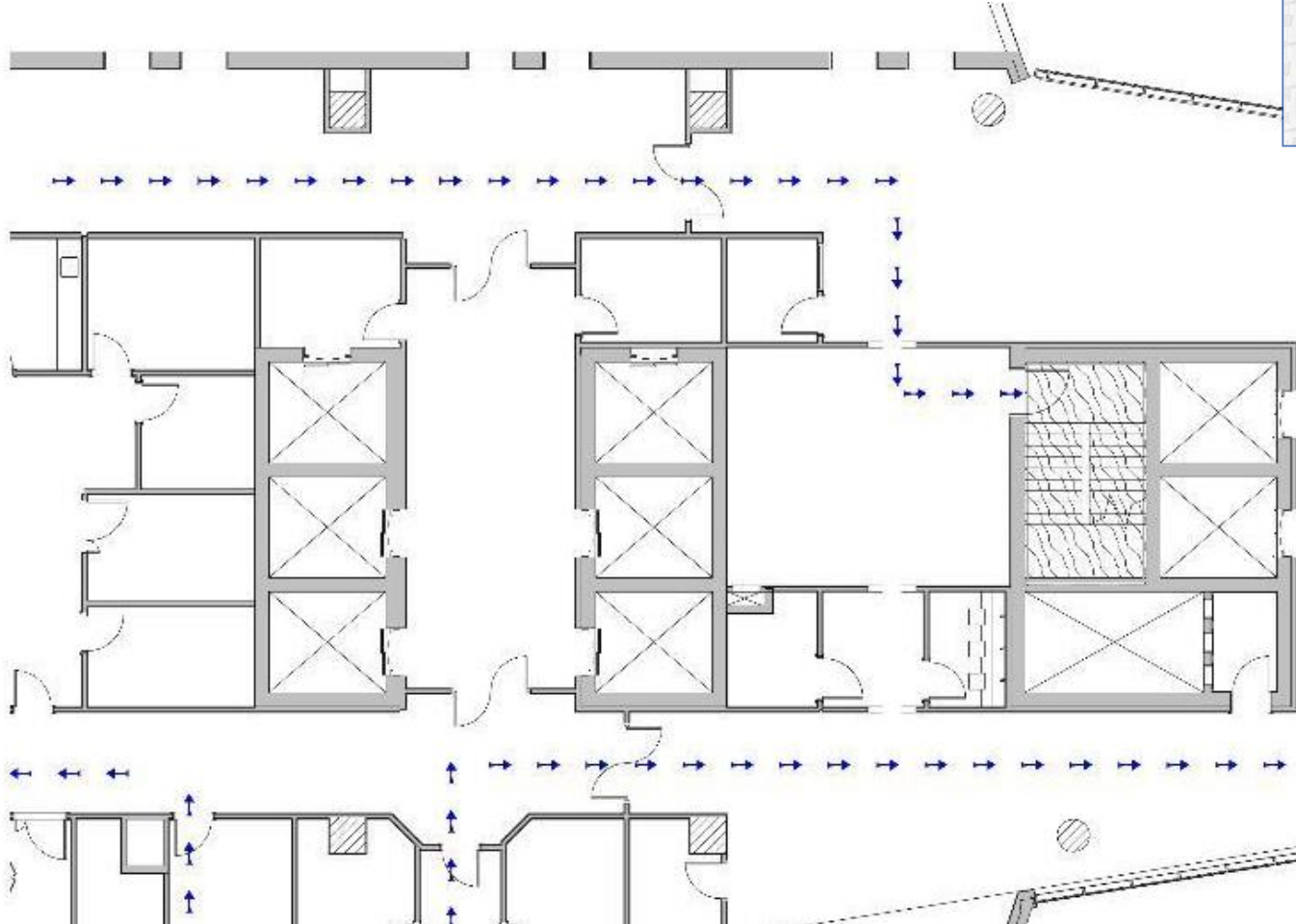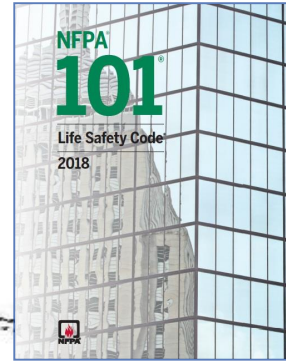
Terminal Block
Internal Locking
Indicator Lamp
Alarm
Nuisance Alarm Switch
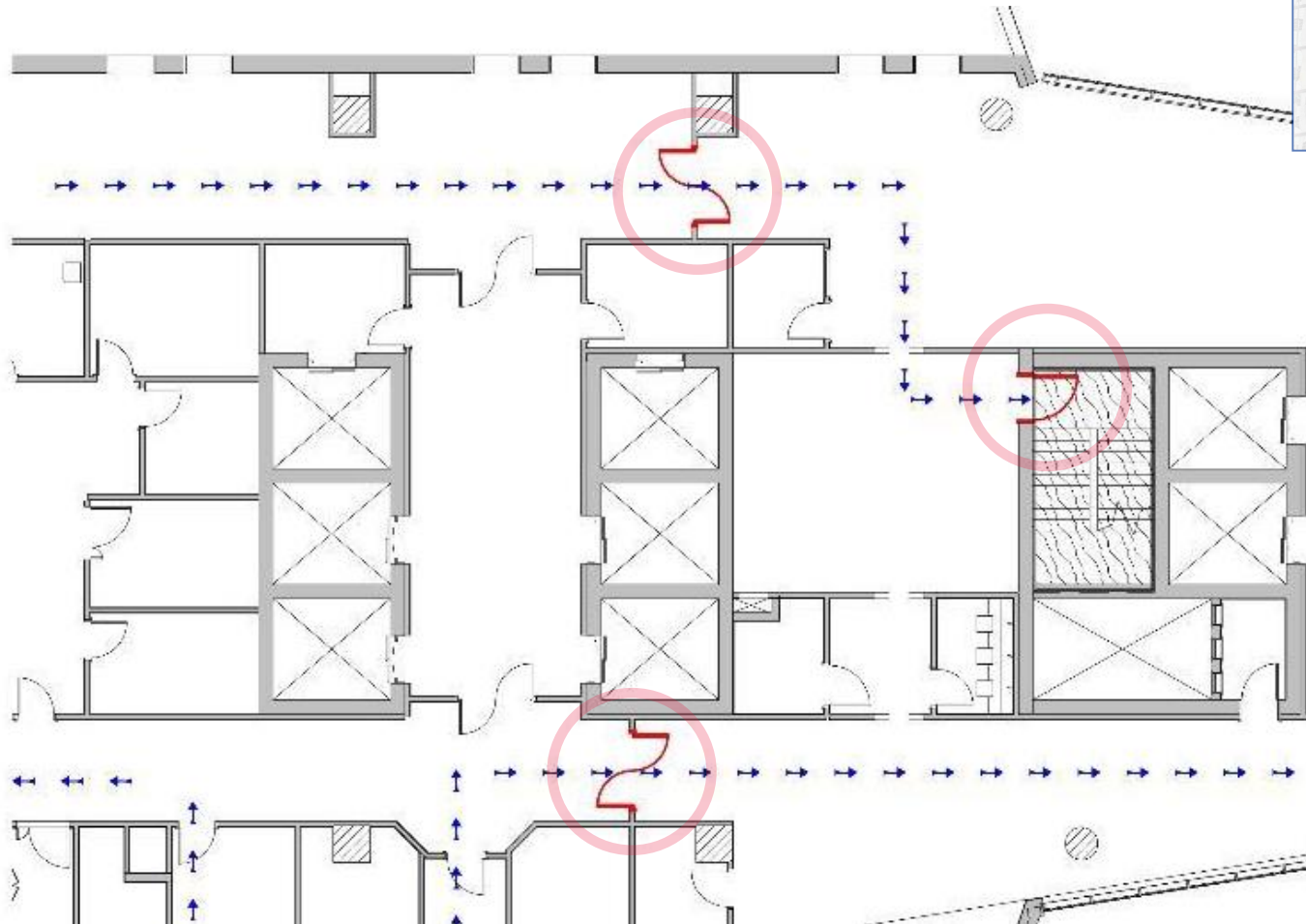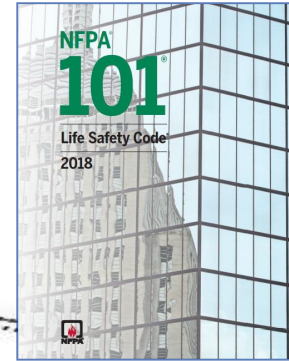Key Switch Control

Egress

Emergency Exit/Escape doors – Swing doors

Egress

Emergency Exit/Escape doors – Swing doors

Egress

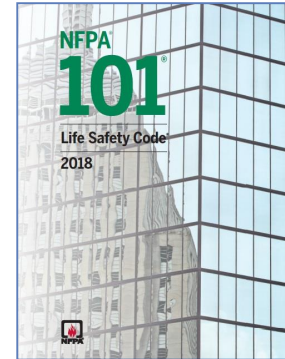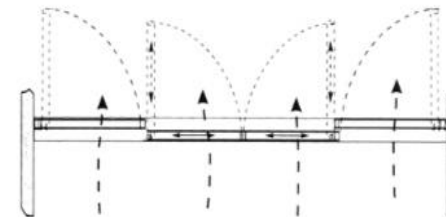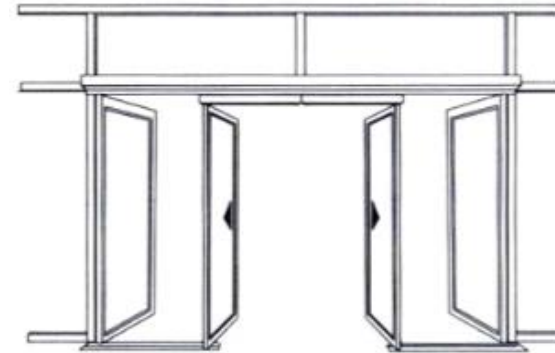## Emergency Exit/Escape doors - Entrance Sliding doors

7.2.1.9* Powered Door Leaf Operation.

IN EMERGENCY, PUSH TO OPEN

7.2.1.9.1.5* In the emergency breakout mode, a door leaf located within a two-leaf opening shall be exempt from the minimum 32 in. (810 mm) single-leaf requirement of 7.2.1.2.3.2(1), provided that the clear width of the single leaf is not less than 30 in. (760 mm).

A.7.2.1.9.1.5 Although a single power-operated door leaf located within a two-leaf opening might alone not provide more than 30 in. (760 mm) of clear width in the emergency breakout mode, where both leaves are broken out to become side hinged, the required egress width is permitted to be provided by the width of the entire opening.

7.2.1.9.1.6 For a biparting sliding door assembly in the emergency breakout mode, a door leaf located within a multiple-leaf opening shall be exempt from the minimum 32 in. (810 mm) single-leaf requirement of 7.2.1.2.3.2(1) if a clear opening of not less than 32 in. (810 mm) is provided by all leafs broken out.
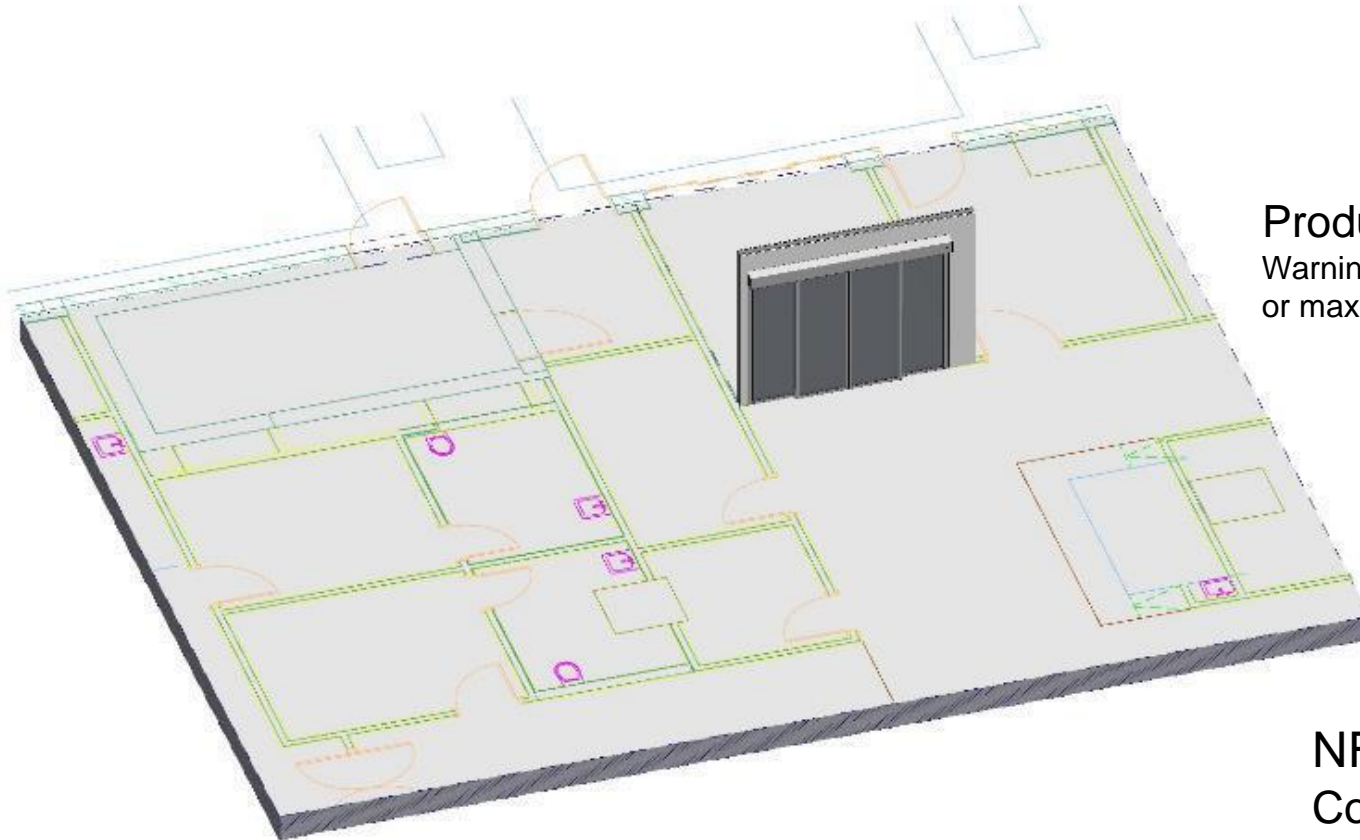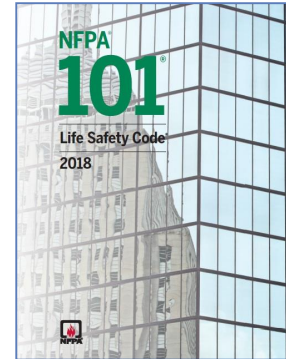
dormakaba

Egress

Emergency Exit/Escape doors - Entrance Sliding doors

Product Constraints ☑
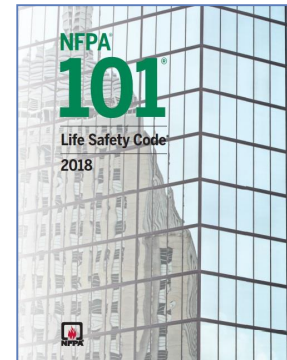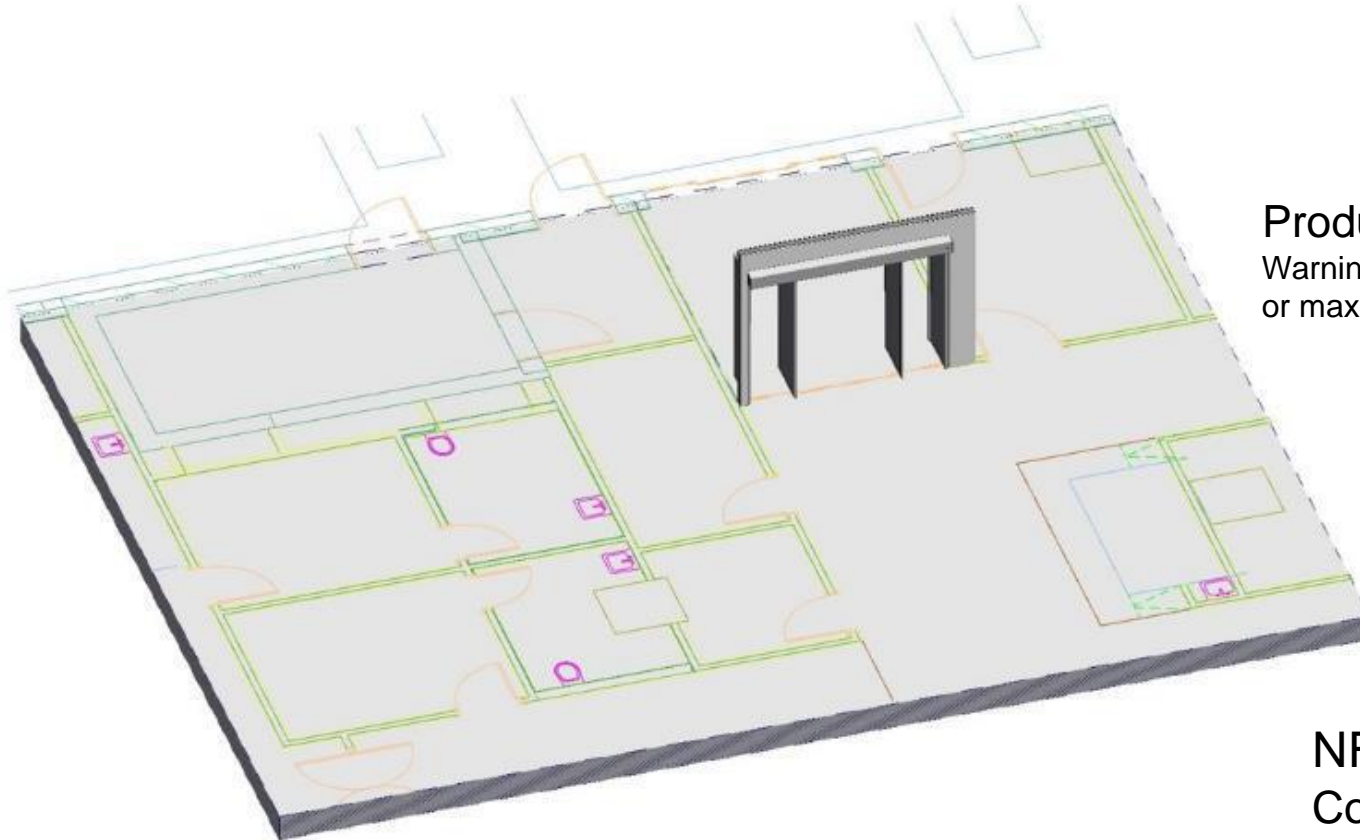Warning text will be visible if minimum or maximum sizes exceeded

NFPA 7.2.1.9
Code Compliance ☐

Check as per NFPA 7.2.1.9

Emergency Breakout, Clear width of Single Panel not less than 32 in.(810mm)

Egress

Emergency Exit/Escape doors - Entrance Sliding doors

Product Constraints ☑
Warning text will be visible if minimum
or maximum sizes exceeded

NFPA 7.2.1.9
Code Compliance ☑

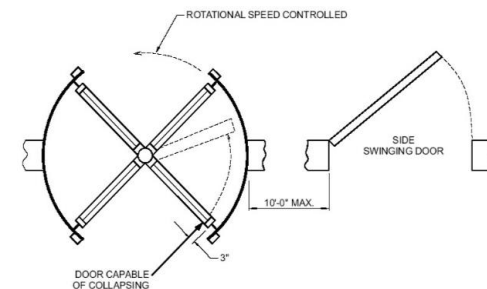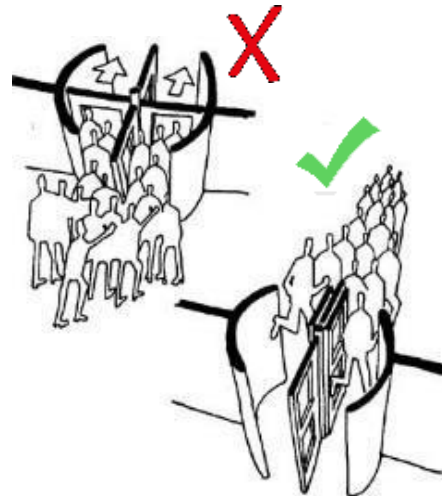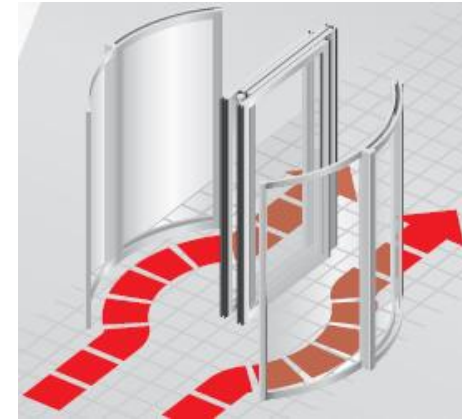# Egress

Emergency Exit/Escape doors - Entrance Revolving doors

NFPA
101
Life Safety Code
2018

7.2.1.10 Revolving Door Assemblies.

7.2.1.10.1 Revolving door assemblies, whether used or not used in the means of egress, shall comply with the following:

(1) Revolving door wings shall be capable of being col-lapsed into a book-fold position, unless they are exist-ing revolving doors approved by the authority having jurisdiction.

(2) When revolving door wings are collapsed into the book-fold position, the parallel egress paths formed shall provide an aggregate width of 36 in. (915 mm), unless they are approved existing revolving door as-semblies.

(6) Each revolving door assembly shall have a conforming side-hinged swinging door assembly in the same wall as the revolving door within 10 ft (3050 mm) of the re-volving door, unless one of the following conditions ap-plies:

dormakaba

Egress

Emergency Exit/Escape doors - Entrance Revolving doors

NFPA
101
Life Safety Code
2018

Product Constraints ☑
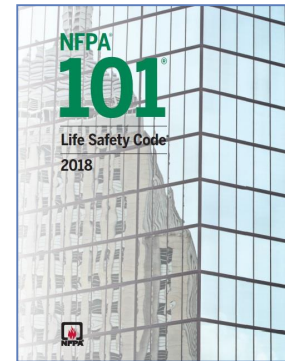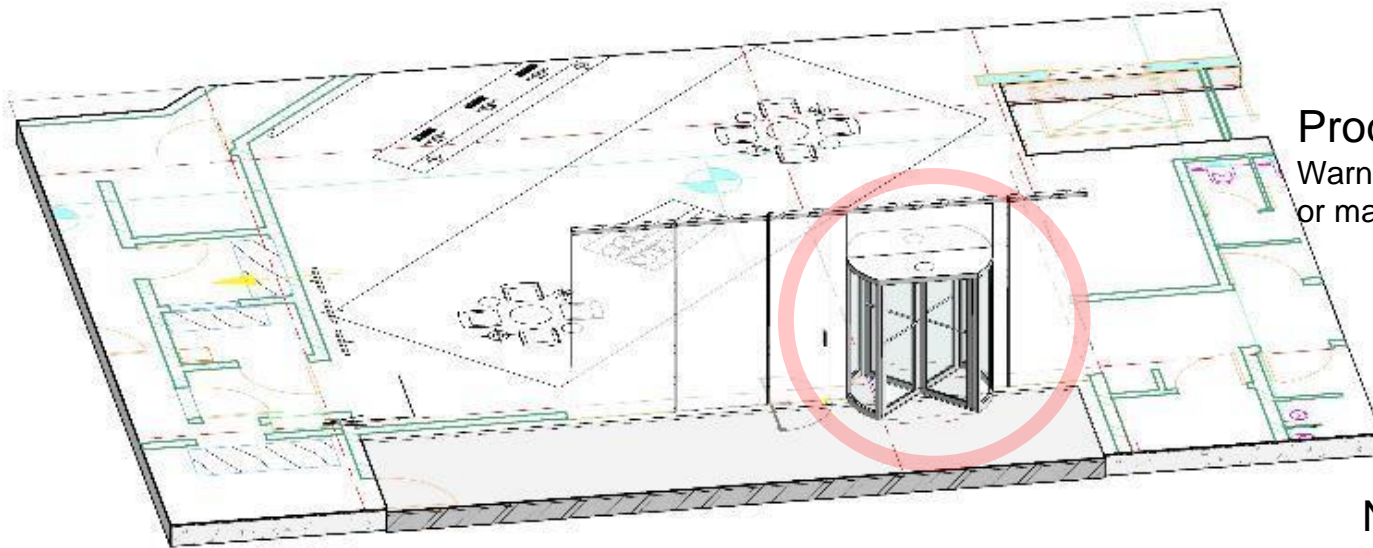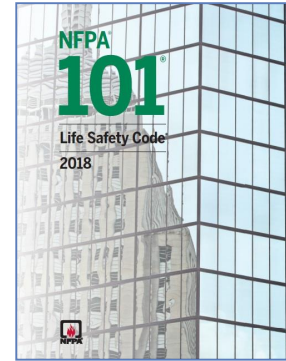Warning text will be visible if minimum or maximum sizes exceeded
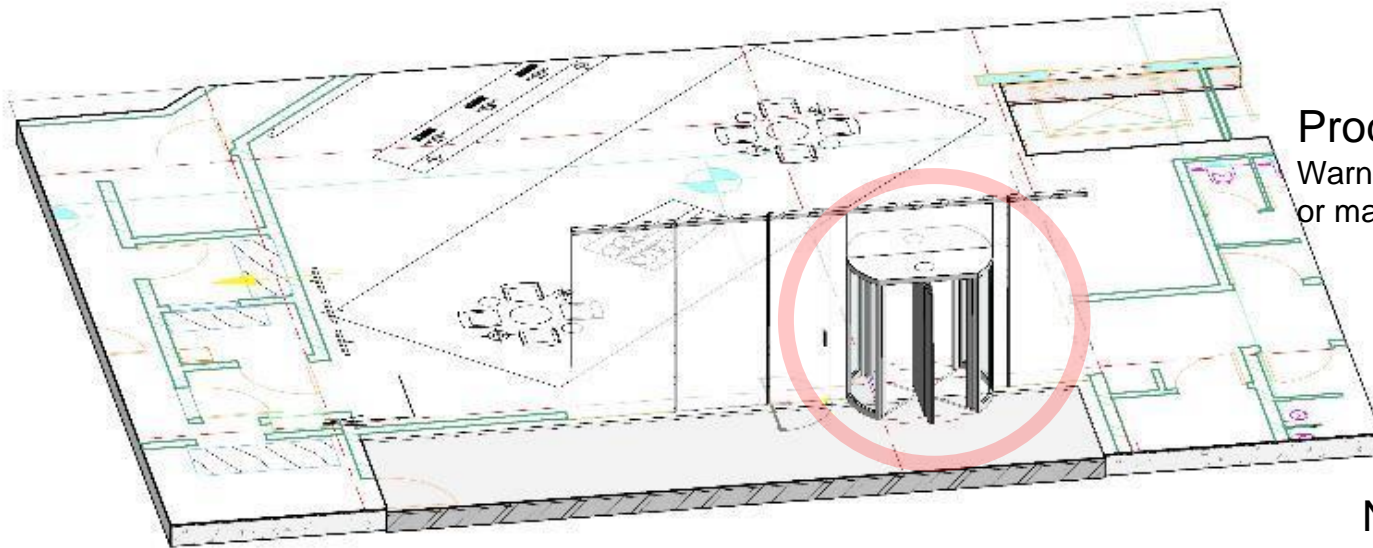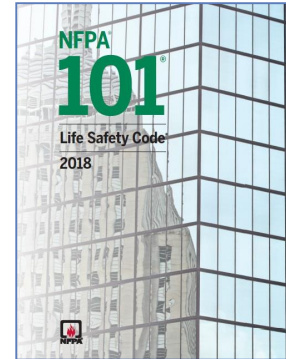
NFPA 7.2.1.10

Code Compliance ☐

Check as per NFPA 7.2.1.10

1. Capable of being Collapsed into book-fold position.

2. In book fold position Parallel Egress paths shall provide an width of 36 in.(915mm).

3. Should have a confirming Side-hinged swinging door assembly within 10ft (3050mm) from the revolving door.

Egress

Emergency Exit/Escape doors - Entrance Revolving doors
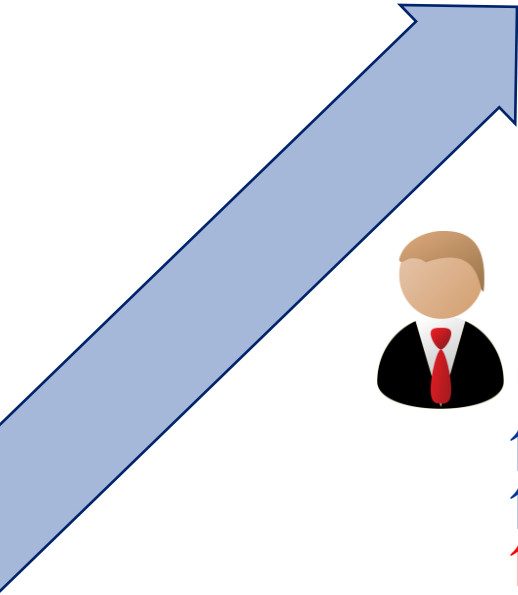
Product Constraints ☑
Warning text will be visible if minimum
or maximum sizes exceeded

NFPA 7.2.1.10

Code Compliance ☑

dormakaba

BIM and Future

Using BIM, AI . . . . . .

↑ Live information
↑ Monitor and Control
↑ IoT
↑ Re-Order, Maintain
↑ Smart Dust / Motes

Using VR, AR, MR

↑ Walkthrough at his will
↑ Interaction with model
↑ Select objects
↑ Make changes
↑ See effects
↑ Make Decisions
↑ Issue approval

Using Professional Software

↑ 3D model,
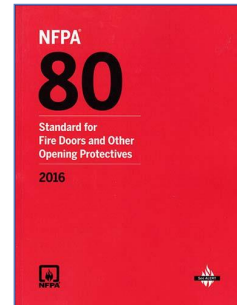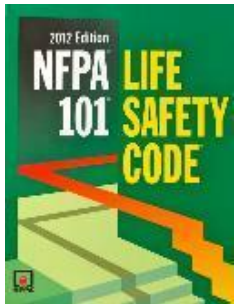↑ Information (products and Codes related)
↑ Walkthrough
BIM ↑ Objects selection

nbs &
BIM 5D Video

Integration of Passive Fire Safety Code Requirements in Building Design using BIM

dormakaba

Thank you!

USING BIM (Building Information Modeling) To Help Achieve Operational Safety In Complex Networks Of Building Management Systems (BMS)

Design
Build
Maintain