Riyadh Conference

Welcome

Integration of Passive Fire Safety Code Requirements in Building Design using BIM, AR, VR and AI

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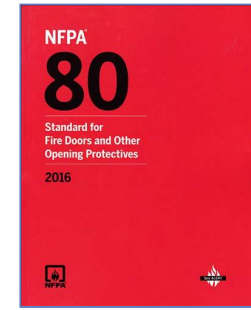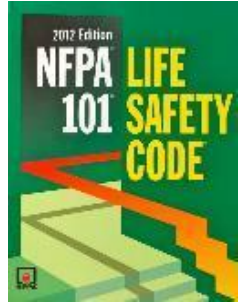
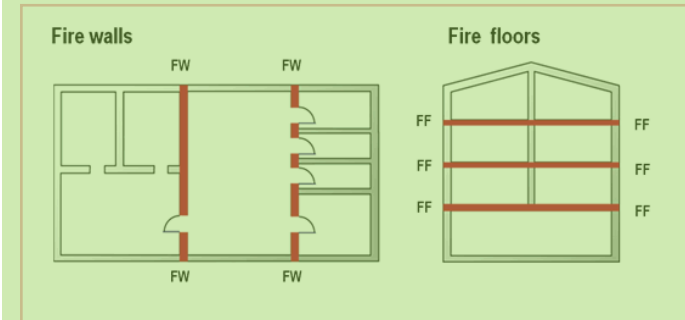# Active and Passive Fire Protections Systems.

Detection

Suppression

Active Components (Need trigger)

Containment

Fire walls   Fire floors

FW   FW

FF   FF

FF   FF

FF   FF

FW   FW

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)

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

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Safe Egress for tenants

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.

Fire damper
Ceiling
Sealed
2-hr wall
25% of wall area
1-hr wall
1½ -hr door with closer
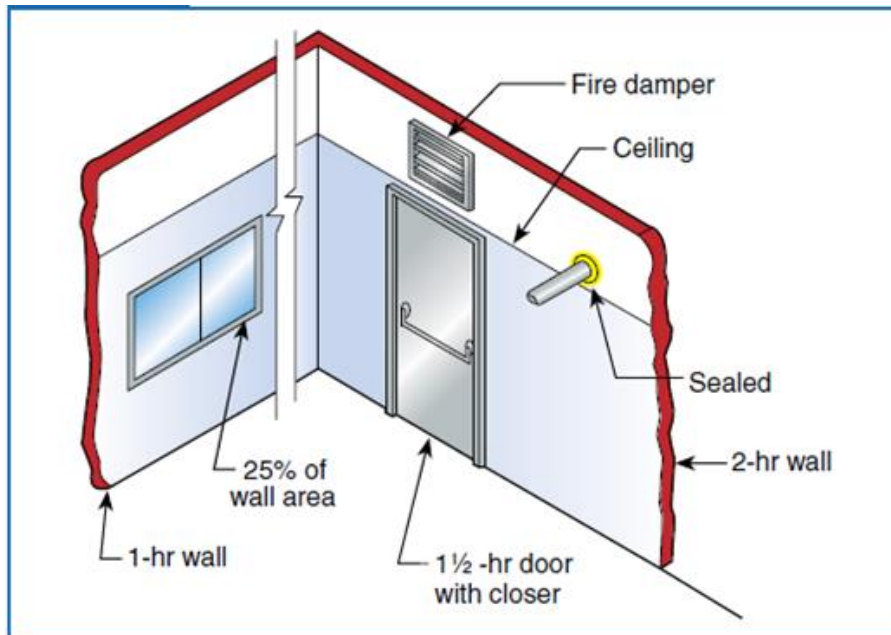
Typical penetrations of a fire barrier.

Global Codes and Standards

Goal of the Code

A goal of this *Code* is to provide an environment for the occupants that is reasonably safe from fire by the following means:

(1)* Protection of occupants not intimate with the initial fire development

(2) Improvement of the survivability of occupants intimate with the initial fire development
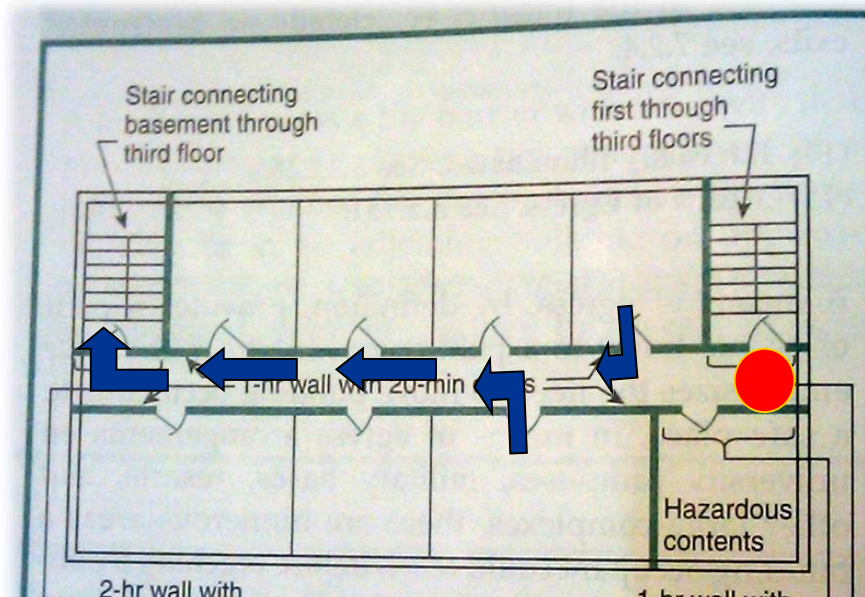
4.5 Fundamental Requirements

1. Provide for adequate safety without dependence on any single safeguard.
2. Provide an appropriate degree of life safety considering the size, shape, and nature of the occupancy.
3. Provide for backup or redundant egress arrangements.
4. Ensure that the egress paths are clear, unobstructed, and unlocked.
5. Ensure that the exits and egress routes are clearly marked to avoid confusion and provide the cues needed for their effective use.
6. Provide adequate lighting.
7. Ensure prompt occupant response by providing early warning of fire.
8. Ensure that required systems facilitate and enhance situation awareness.
9. Ensure the suitable enclosure of vertical openings.
10. Ensure compliance with applicable installation standards.
11. Maintain all required features in proper working order.
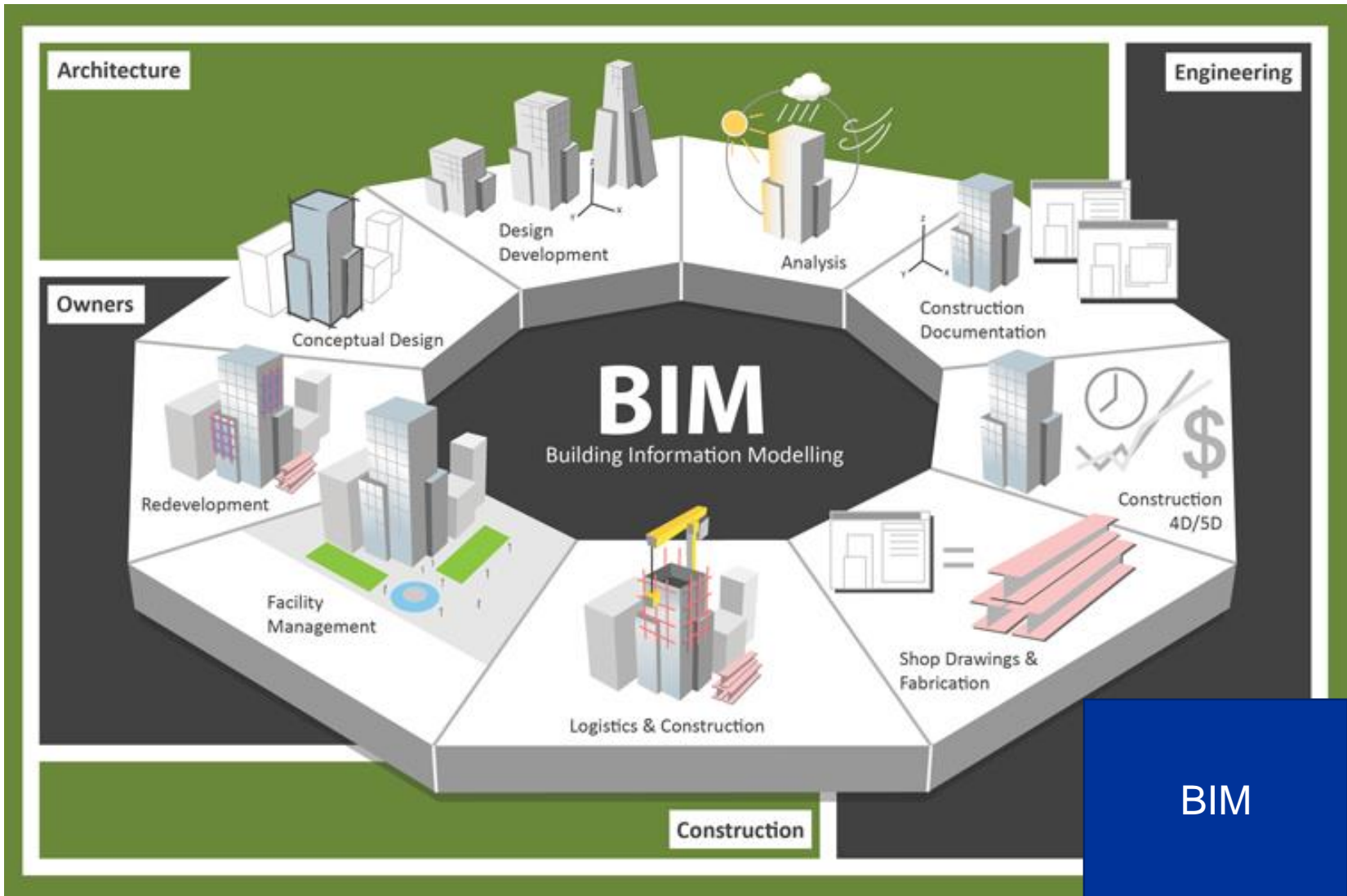
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BIM

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 Model**ing** ✓

Several Software support BIM:

- Revit

- ArchiCAD,

- Bentley Architecture,

- IDEA Architectural

and several others.

BIM – Products

Building
Products in
BIM

BIM – Products

Project Browser

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
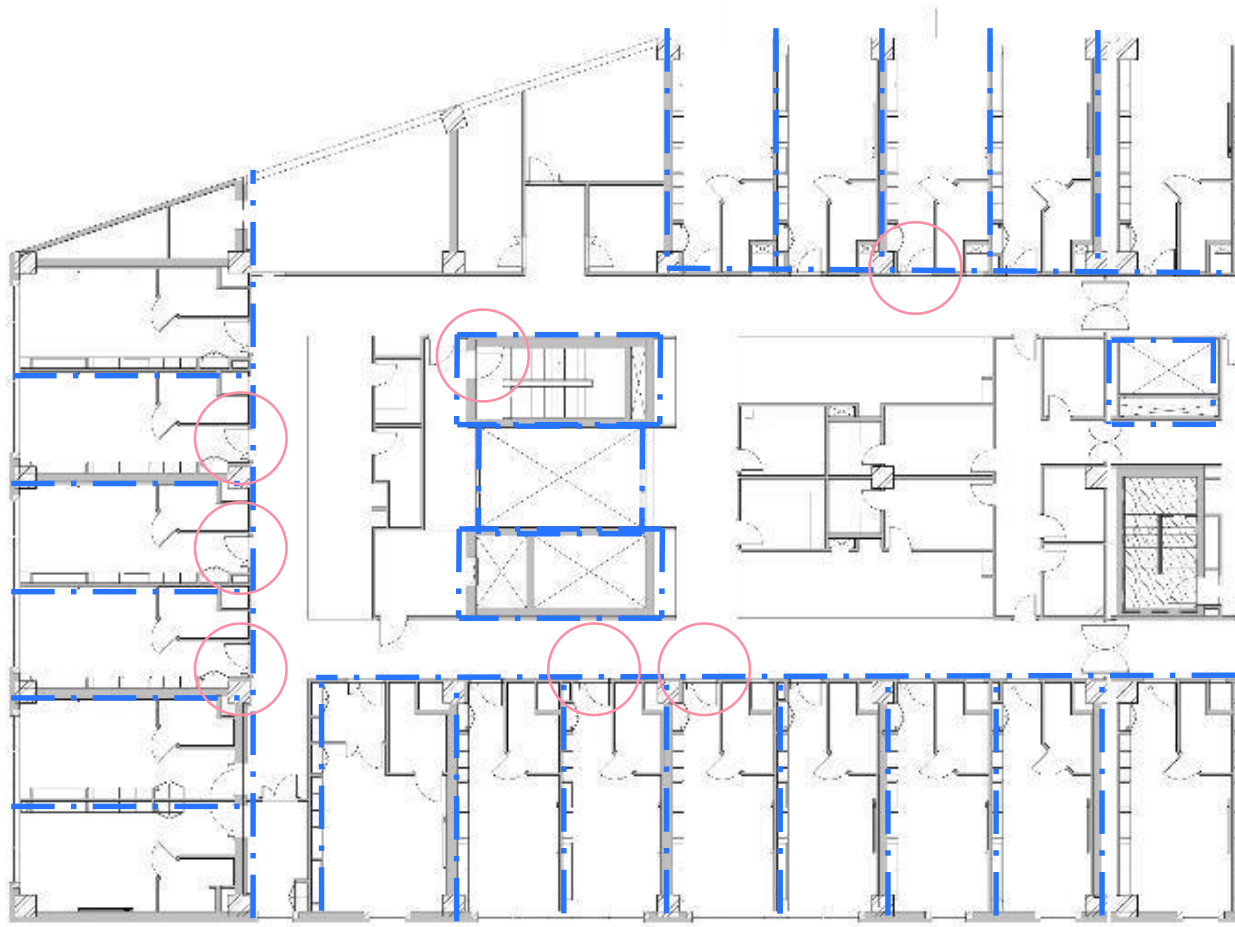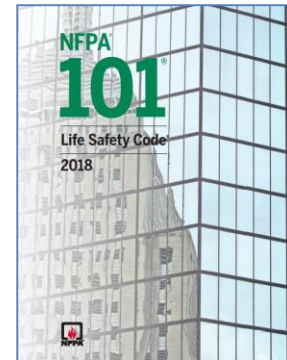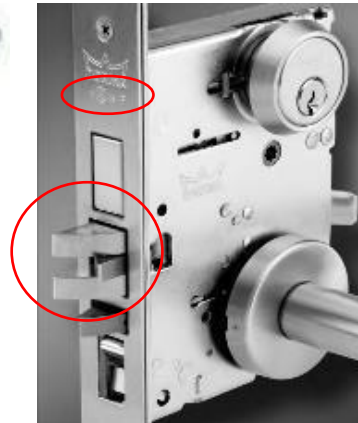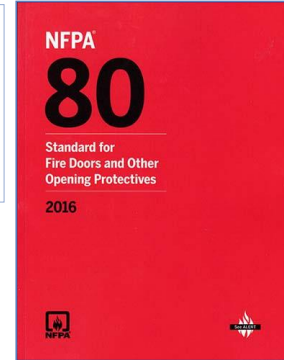
Rated Lock with Latch

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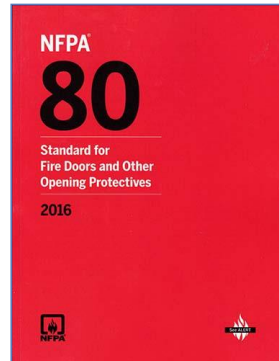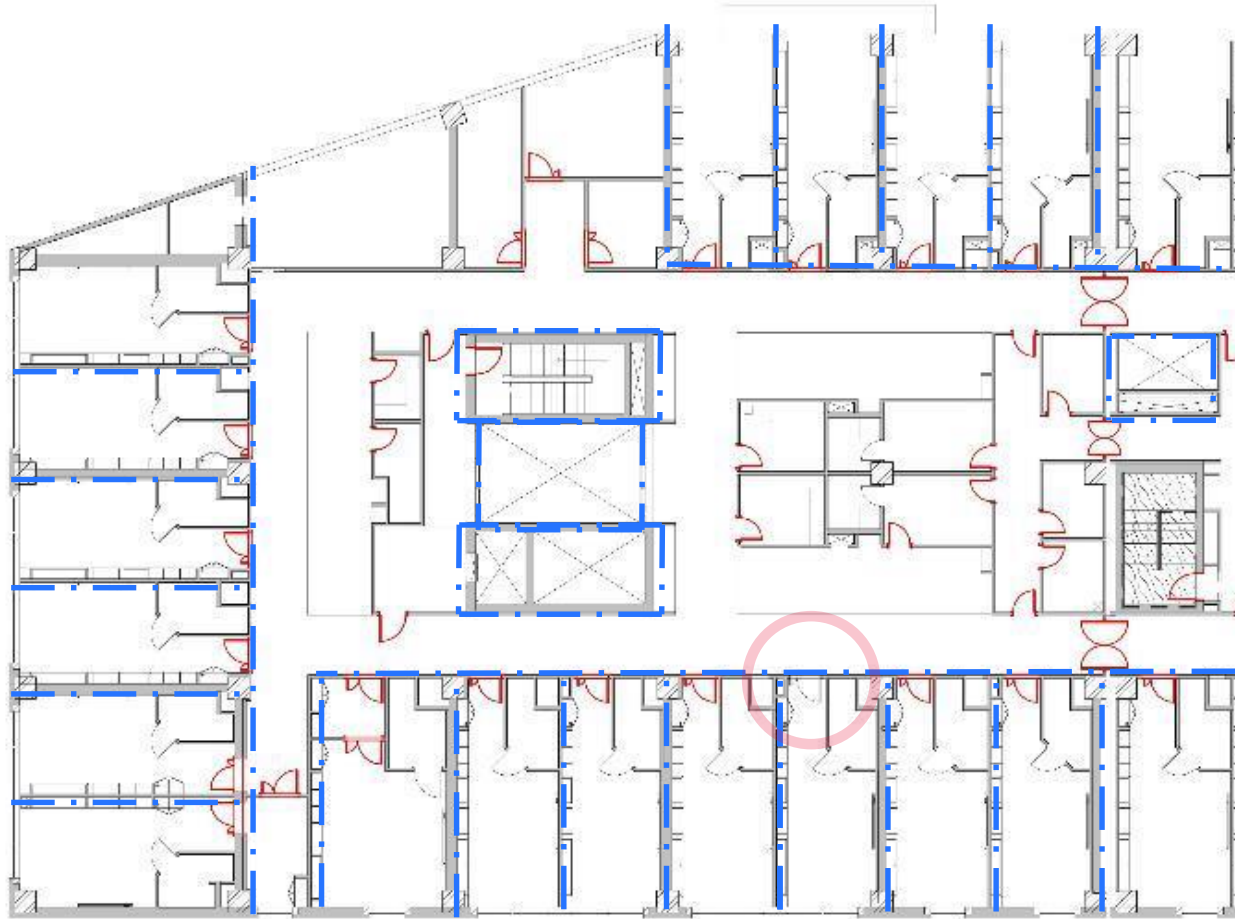
Compartmentation

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

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Occupant Load / Number of Exits

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

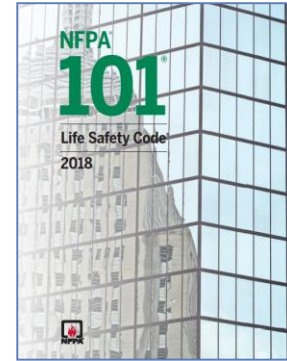**18.2.4.1** Not less than two exits shall be provided on every story.

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.
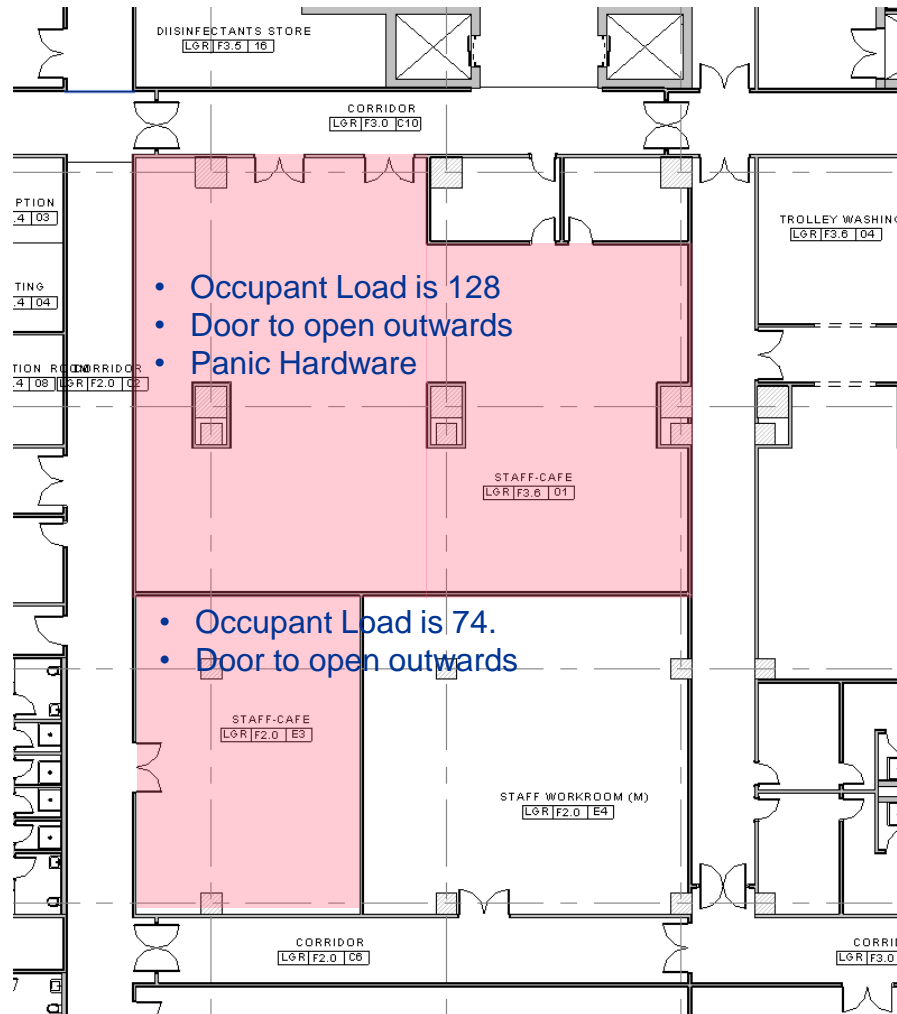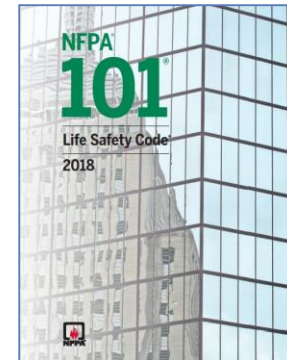
Occupant Load / Number of Exits

NFPA
101
Life Safety Code
2018
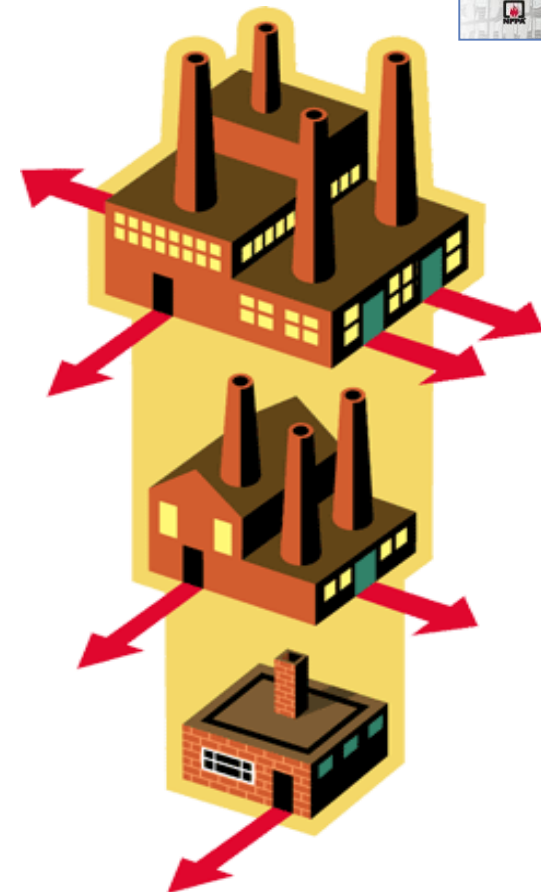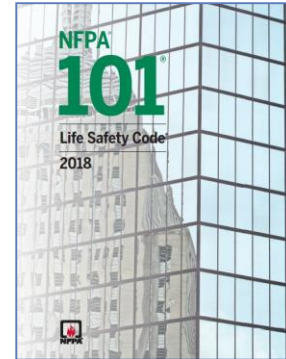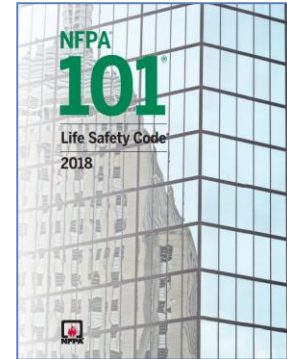
Code Compliance ☐

Occupant Load / Number of Exits

- 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 ✓
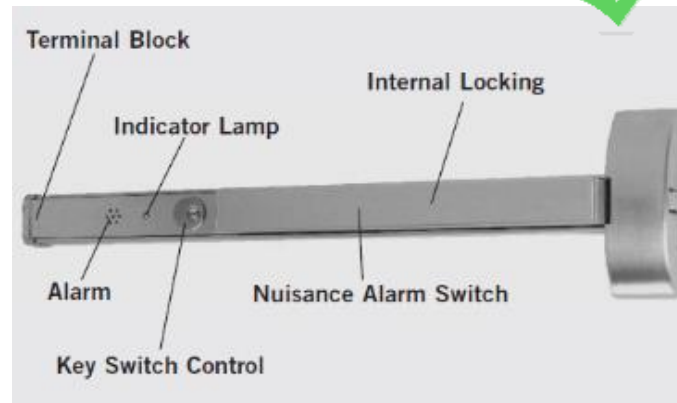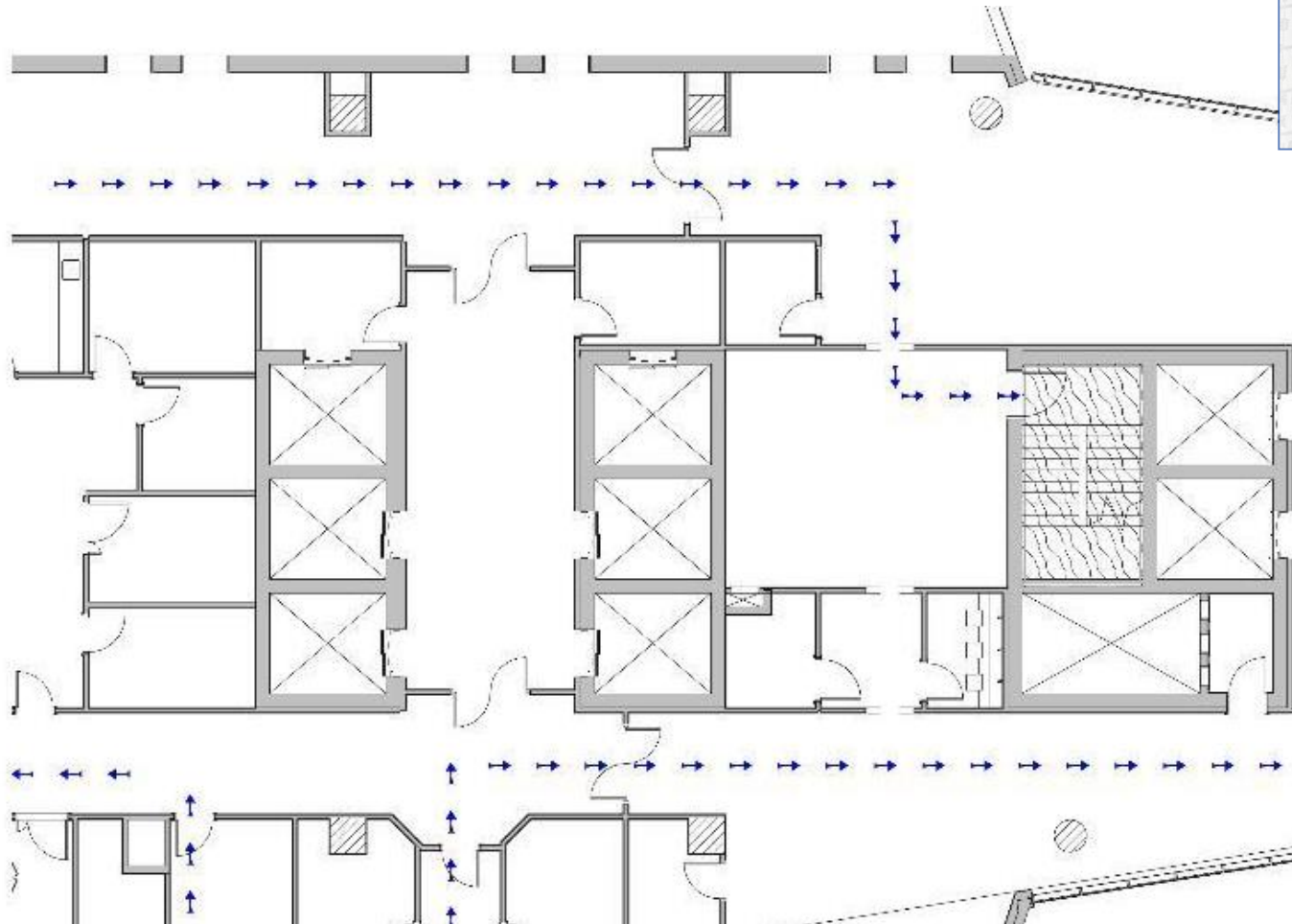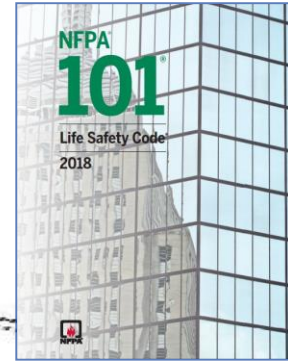
Terminal Block
Indicator Lamp
Internal Locking
Alarm
Nuisance Alarm Switch
Key Switch Control

Egress

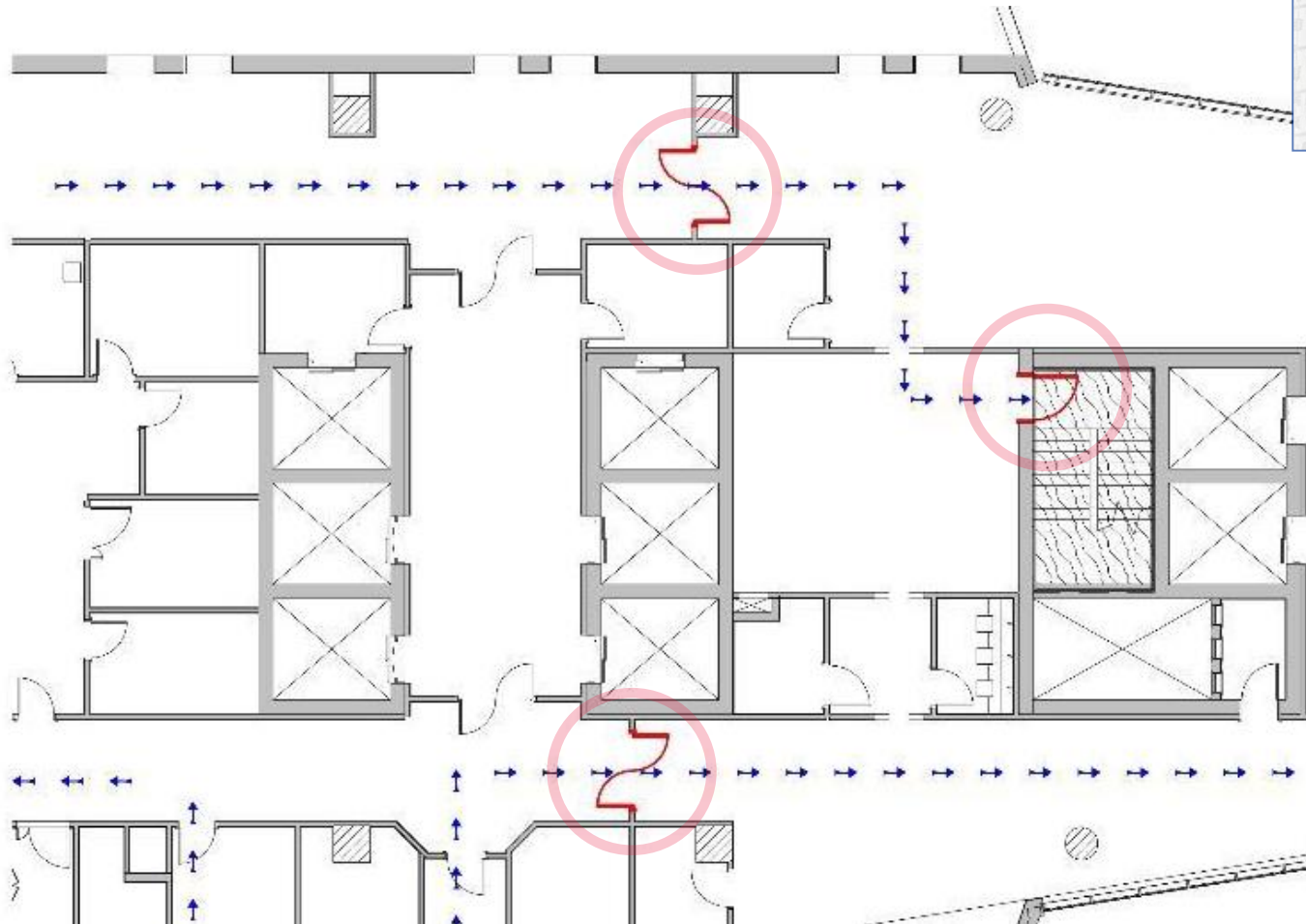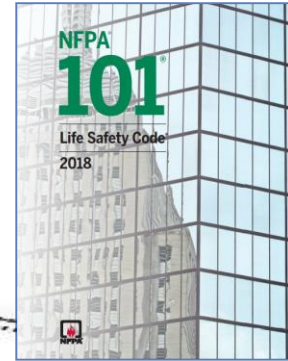Emergency Exit/Escape doors – Swing doors

Egress

Emergency Exit/Escape doors – Swing doors

Egress

Emergency Exit/Escape doors - Entrance Revolving doors

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 collapsed into a book-fold position, unless they are existing 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 assemblies.

(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 revolving door, unless one of the following conditions applies:
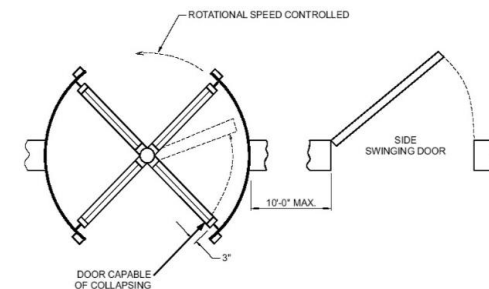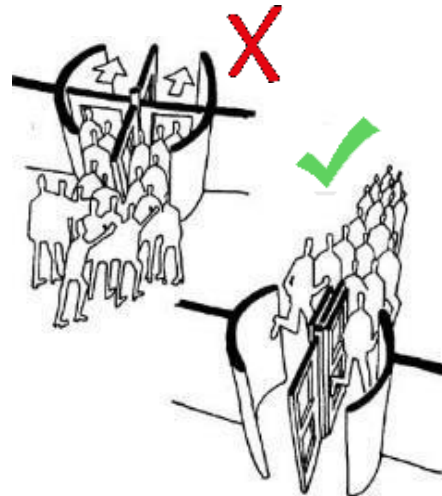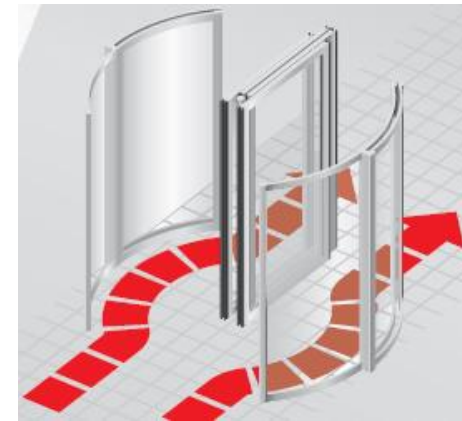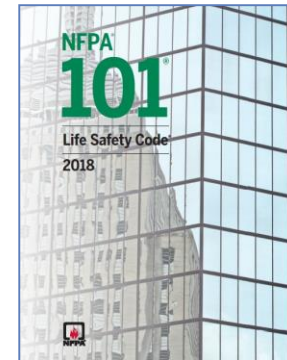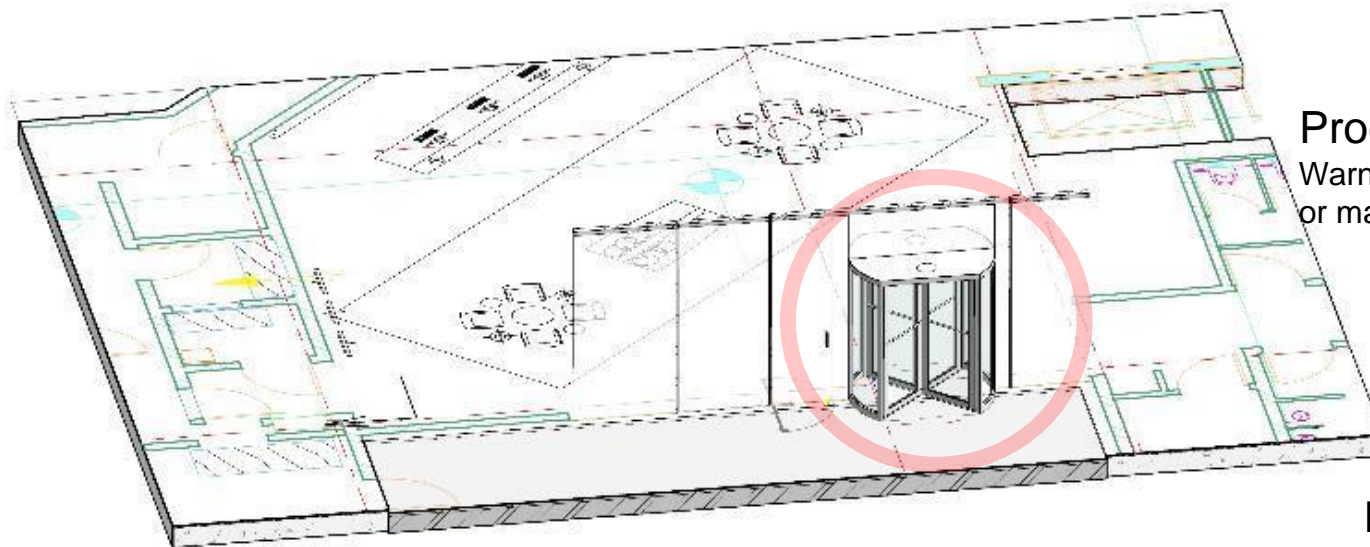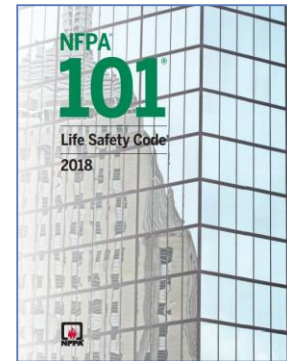
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Egress

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
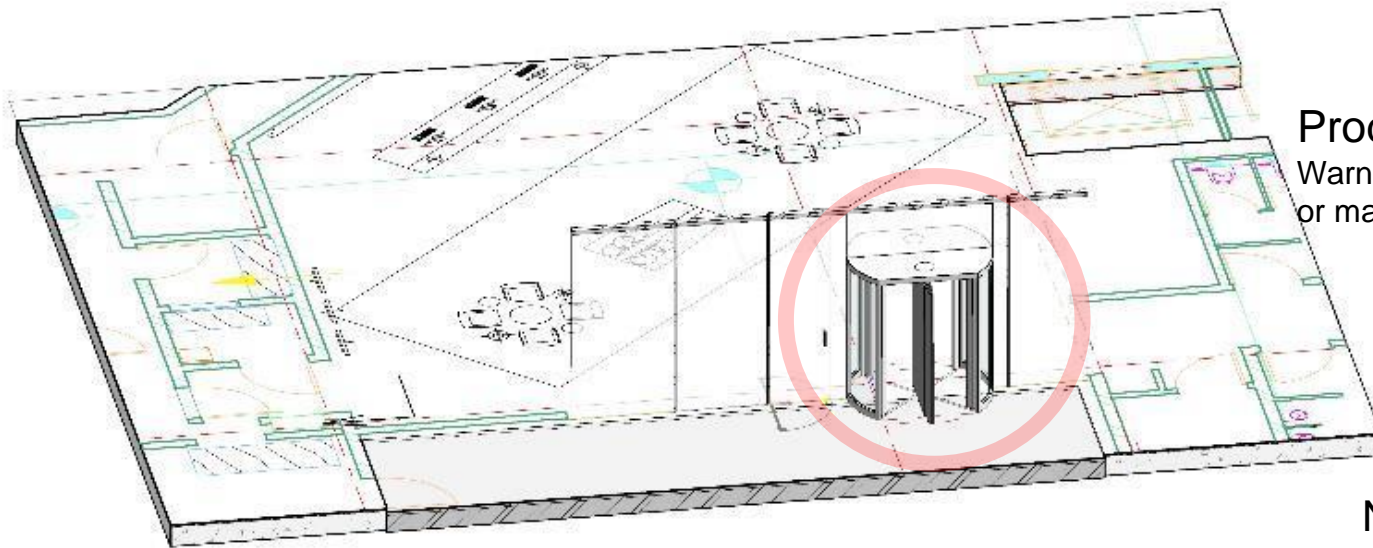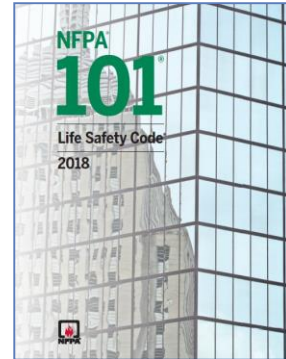
NFPA
101®
Life Safety Code
2018

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

NFPA 7.2.1.10

Code Compliance ☑

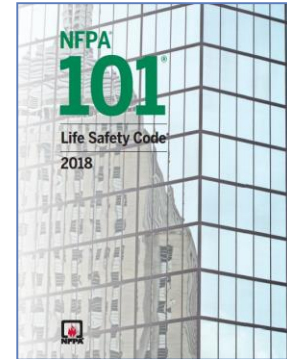dormakaba

Egress

Emergency Exit/Escape doors - Turnstiles

NFPA
101®
Life Safety Code
2018

7.2.1.11 Turnstiles.

7.2.1.11.1.2 Where turnstiles are approved by the authority having jurisdiction and permitted in Chapters 11 through 43, each turnstile shall be credited for a capacity of 50 persons, provided that such turnstiles meet the following criteria:

(1) They freewheel in the egress direction when primary power is lost, and freewheel in the direction of egress travel upon manual release by an employee assigned in the area.

(2) They are not given credit for more than 50 percent of the required egress width.

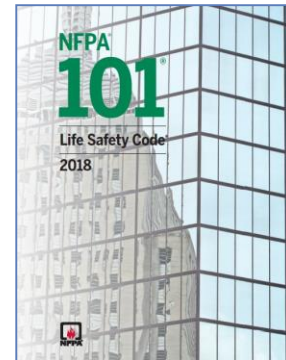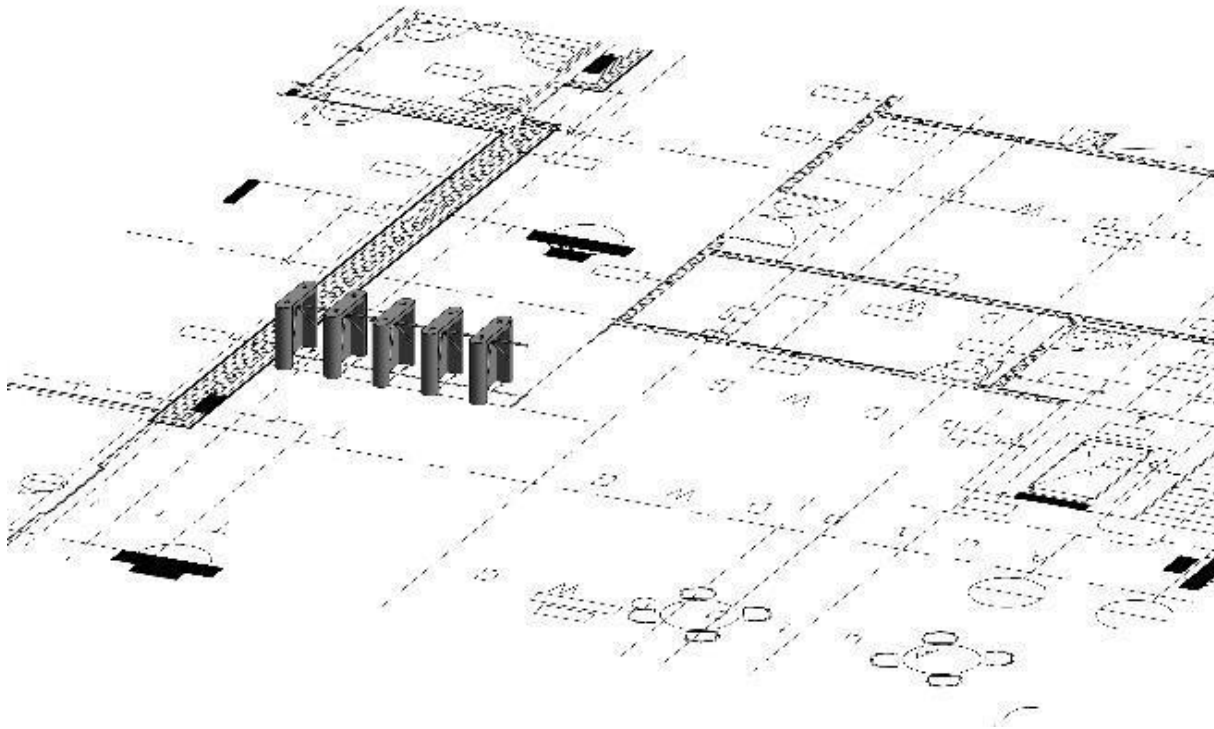(3) They are not in excess of 39 in. (990 mm) in height and have a clear width of not less than 16½ in. (420 mm).

7.2.1.11.2 Turnstiles exceeding 39 in. (990 mm) in height shall meet the requirements for revolving door assemblies in 7.2.1.10.

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Egress

Emergency Exit/Escape doors - Turnstiles

NFPA
101
Life Safety Code
2018

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

NFPA 7.2.1.11

Code Compliance ☑

Check the following Criteria as per NFPA 7.2.1.11

1. Freewheel in direction of egress when power is lost.

2. Freewheel in the direction of egress travel upon manual release.

3. Maximum height of 39 in (910mm) and Width not less   than 16 1/2 in. (420mm)

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BIM to VR, AR, MR…

VR

image courtesy of Augm

AR

MR

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BIM and Future

Facility Managers

Using   BIM, Sensors, Connectivity, AI . . . .

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

Clients

Using VR, AR, MR

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

Designers

Using Professional Software

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

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

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Thank you!

Integration of Passive Fire Safety Code Requirements in Building Design using BIM, AR, VR and AI

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