



# Dammam Conference

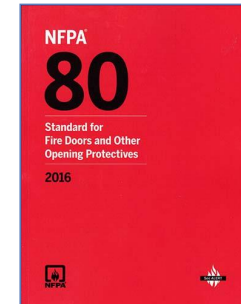
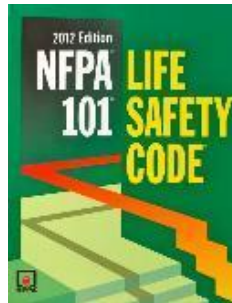
October 10, 2018, Sheraton Dammam

## Welcome

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



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



# Presenter Intro.

**Altaf A. Afridi**, PMP, LEED AP, FDAI.  
Deputy Vice President Marketing | MEA, AS EMEA

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Mr. Afridi, leads the Marketing and Architectural Specification team at dormakaba, Middle East & Africa.

A Civil Engineer having 18 years experience in Architectural hardware and openings industry of his total 23 years experience. Specialist of fire rated doors, a certified **Fire Door Assembly Inspector** (FDAI) the first one outside US, certified **Project Management Professional** (PMP), **LEED AP** and Life Safety code (NFPA 101) specialist related to Architectural openings.

Mr. Afridi attributes his learning to working with architects. He learnt NFPA 101 Life Safety Code, NFPA 80 and other related Standards from architects while assisting them in related solutions and thus gained a good data base of lessons learnt. He has been doing presentations on Life Safety code at architect offices in UAE, Saudi Arabia, Jordan, Lebanon, Qatar and other places in the region.

He has been assisting architects providing solutions including products:

1. Manual and Automatic Doors,
2. Door hardware,
3. Movable walls,
4. Glass fittings and
5. Access control products and systems.



His company dormakaba was known as DORMA and KABA in the industry before merger in 2015.

# Topic Description

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

**Architectural openings, one of the component of the Passive Fire Protection systems, are more about Life Safety than just egress and fire rating.**

The automatic and manual revolving, sliding or swing door can be hazardous for users unless properly designed as per relative standards and codes. More so when we deal with frameless glass assemblies and the user group includes disabled, elderly people and children.

Also, adding security hardware may cause safety issues for doors. The presentation will focus on these points, what guidelines relative codes and standards provides about these.

We will also focus on how **BIM (Building Information Modeling) can help us in achieving safe building** in today's complex building systems.



# Learning Objectives

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

- 1. Definition of Passive Fire Safety, related Code Requirements and some examples.*
- 2. Examples Integrating these into BIM.*
- 3. Video (Advertisements by BIM contents and related Application developers)*

The purpose of this presentation is to convey technical knowledge to the conference participants.

The presentation also contains slides with text that summarises the content of the presentation and the main learning objectives.

These may be used to update CPD records for relevant organisations including the Chartered Institute of Building (CIOB).

# Active and Passive Fire Protections Systems.

## Detection



## Suppression



Active Components (Need trigger)

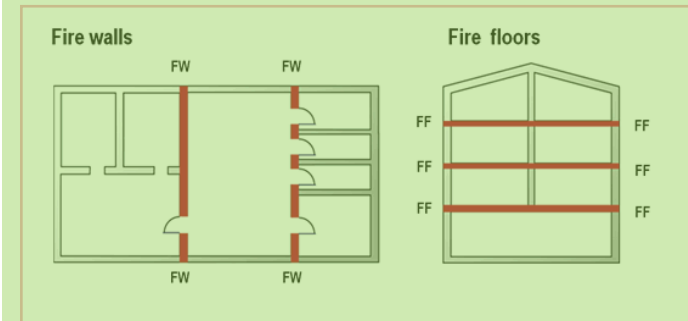
## Active Fire Protection

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.)

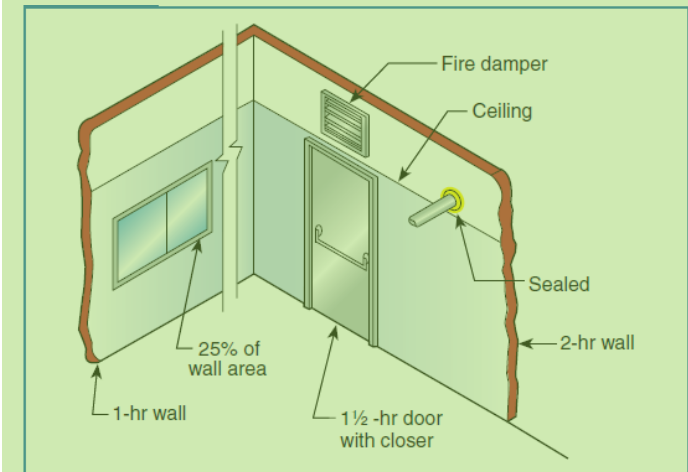
## Passive Fire Protection

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)

## Containment



Passive Components (Always there)



Typical penetrations of a fire barrier.

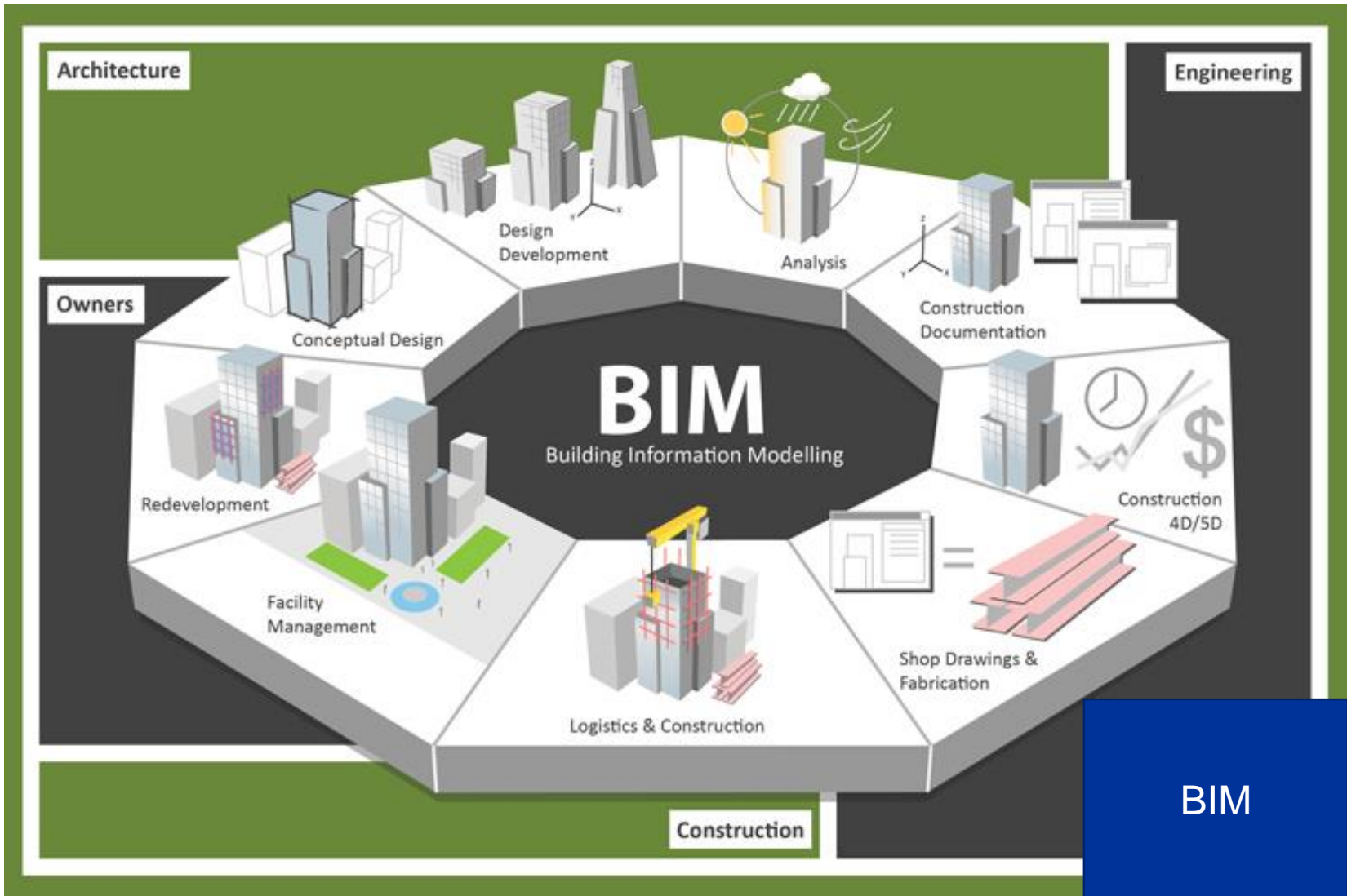
## Integration of Passive Fire Safety Code Requirements in Building Design using BIM

# 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 Definition

- A 3D model of building **X**
- A software. **X**
- Building Information Management **X**
- Building Information Model **X**



# BIM Definition

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



# BIM Definition

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

Several Software support BIM:

– Revit



AUTODESK®  
REVIT®

- ArchiCAD,
- Bentley Architecture,
- IDEA Architectural

and several others.

# 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

VR, AR, MR . . . .

<i>BIM (Building Information Modelling) Definition</i>		<i>Source</i>
1	BIM is construction of a <b>model</b> that contains the <b>information</b> about a building from all phases of the building life cycle	ISO 16757-1: 20151
2	BIM is discrete set of electronic object-oriented <b>information</b> 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 <b>rich information model</b> , 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 <b>physical and functional characteristics</b> 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 <b>data model</b> 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 <b>physical and functional characteristics</b> of a facility. As such it serves as a shared knowledge resource for <b>information</b> 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 <b>physical and functional characteristics</b> of a facility creating a shared knowledge resource for <b>information</b> 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 <b>model</b> to <b>inform</b> 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

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

VR, AR, MR . . . .



# BIM – Products



## BIM – Products

The screenshot displays a BIM software interface with a 'Properties' panel on the left and a 2D architectural drawing of a door on the right. The 'Properties' panel shows the following data:


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

The architectural drawing shows a door with dimensions of 850.00 and 850.00. Hardware labels include '098-029 HWS- 1' and '43260'. A dashed line indicates the door's swing path.


## 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


# BIM – Products - Reports

SCHEDULE FOR IRONMONGERY-01			
CODE	DESCRIPTION	FINISH	IMAGE
3917	Flush extension bolt for Metal doors, size 1" X 6.75", with 12" extension rod, 17.5mm throw, UL Listed, (suitability of the mortised flush bolt to be confirmed as per the exact door thickness and the other hardware on the door at the time of order)	SCP	




### D.P. STRIKE




2183	Aluminium dust proof strike	SCP	
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### DUST PROOF STRIKE



3911	Adjustable dust proof strike to receive bolt of bottom flush bolt on inactive leaf.	SCP	
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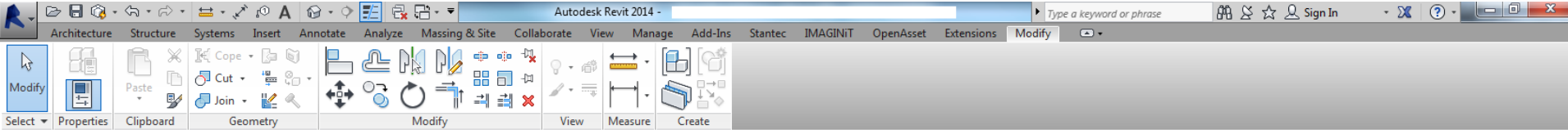
### CYLINDER

Gege AP2000-DKZ Classroom function	Europrofile Cylinder 35/35mm with knob thumb turn one side, 6 pin tumblers under GMK - Thumb turn retracts dead bolt and no locking by the thumb turn.	Ni	
Gege pExtra SCHR.Z	Mortise Cylinder, cam suitable for DORMA ANSI Panic Bar outside trim.	Ni	
Gege pExtra-DKZ Classroom function	Europrofile Cylinder 35/35mm with knob thumb turn one side, 6 pin tumblers under GMK - Thumb turn retracts dead bolt and no locking by the thumb turn.	Ni	

SCHEDULE FOR IRONMONGERY-01			
CODE	DESCRIPTION	FINISH	IMAGE
F9600LB xZT08	Dorma 9000 series Narrow Stile Concealed Vertical rod, Less bottom rod exit device, fire-rated, With Full length touchbar, 19mm (3/4") dead locking latchbolt, Length as per door width, with #418 standard keeper, field reversible handing. With outside trim. Tested and approved to EN 1125, CE marked.	SSS	
F9700 MLRxZP11EP	Dorma 9000 series Narrow Stile Rim exit device with full length touch bar, fire-rated, 19mm dead locking latchbolt. Length as per door width, with #463 standard keeper, field reversible handing. With outside trim including Euro profile cylinder adaptor. Entrance by Thumbturn and pull including Euro profile cylinder adaptor. Key locks or unlocks thumbturn Tested and approved to EN 1125, CE marked. With Motorised Latch Retraction (MLR) feature, 32V, 14-18 Amp inrush for 200 milliseconds, 1 Amp holding current [CABLE LOOP & POWER SUPPLY REQUIRED]	SSS	
F9700 xZT08-EP	Dorma 9000 series Narrow Stile Rim exit device with full length touch bar, fire-rated, 19mm dead locking latchbolt. Length as per door width, with #463 standard keeper, field reversible handing. With outside trim including Euro profile cylinder adaptor. Entrance by lever, key locks or unlocks lever. Tested and approved to EN 1125, CE marked.	SSS	

### LEVER HANDLE

CORE 8999/6500	CORE spring assisted Lever handle, Non-handed configurations, with corrosion protected steel baseplate, with robust maintenance free plain bearing, with four return springs for a perfectly horizontal rest position, with 55mm dia round roses, back to back fixing screws, compliant with EN -1906 category 4 and DN18273. Compliant to environmental product declaration (EPD) to ISO 14025.	SSS	
CORE 8999/6500/3020N / 6612	CORE spring assisted Lever handle inside and fixed flat dead knob outside, Non-handed configurations, with corrosion protected steel baseplate, with robust maintenance free plain bearing, with four return springs for a perfectly horizontal rest position, with 55mm dia round roses and escutcheons, back to back fixing screws, compliant with EN -1906 category 4 and DN18273. Compliant to environmental product declaration (EPD) to ISO 14025.	SSS	



Properties

Sheet

Sheet: DOOR SCHEDULE Edit Type

Graphics

Visibility/Graphics ... Edit...

Scale

View Purpose

Text

FILTER PARAMETER

DISCIPLINE

SEQUENCE NO

Proto

IssueNum01

IssueDat01

IssueDes01

IssueDat02

IssueDes02

IssueNum02

Identity Data

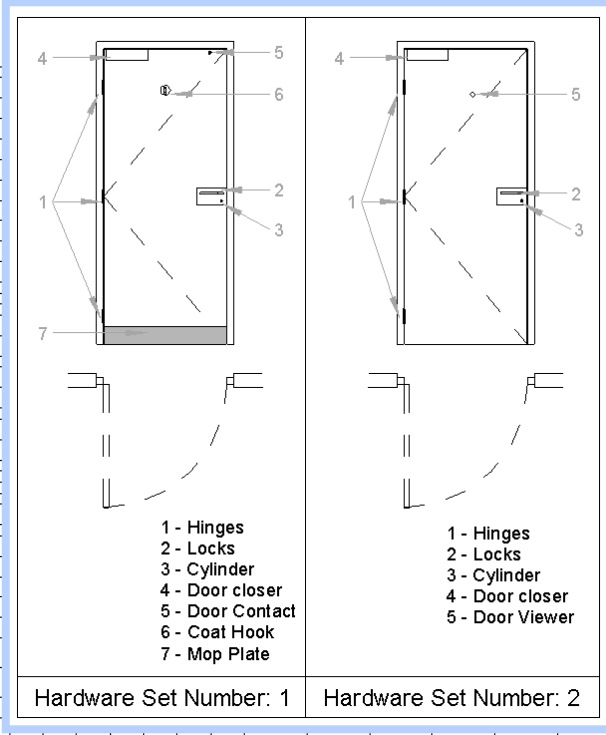
Properties help

Apply

Project Browser - Proto 70\_esaint.nvt

- A3.8a - EXTERIOR WALL SECTIONS
- A4.0 - ROOF PLAN
- A4.1 - ROOF DETAILS
- A4.2 - ROOF DETAILS
- A4.3 - ROOF DETAILS
- A4.4 - ROOF DETAILS
- A4.5 - ROOF DETAILS
- A4.6 - ROOF DETAILS
- A4.7 - ROOF DETAILS
- A4.8 - ROOF DETAILS
- A5.0 - FRONT ENTRANCE ENLARGED PL
- A6.0 - WASHROOM & UNIVERSAL TOILE
- A6.1 - BREAKROOM & REAR OFFICES PL
- A7.0 - ROOM FINISH SCHEDULE
- A8.0 - DOOR SCHEDULE**
- A8.1 - DOOR & WINDOW TYPES
- A8.2 - DOOR & WINDOW DETAILS
- A8.3 - DOOR & WINDOW DETAILS
- A8.4 - DOOR & WINDOW DETAILS
- C1 - COVER SHEET
- CC1 - CODE MATRIX AND COMPLIANCE
- CC2 - CODE COMPLIANCE SITE PLAN

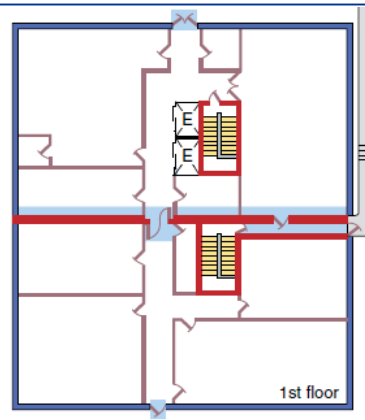
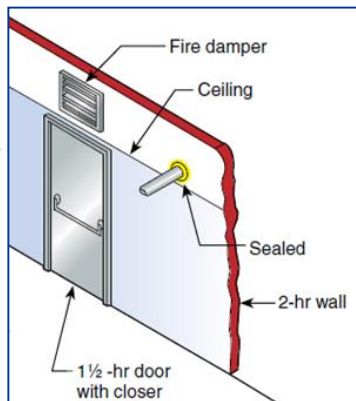
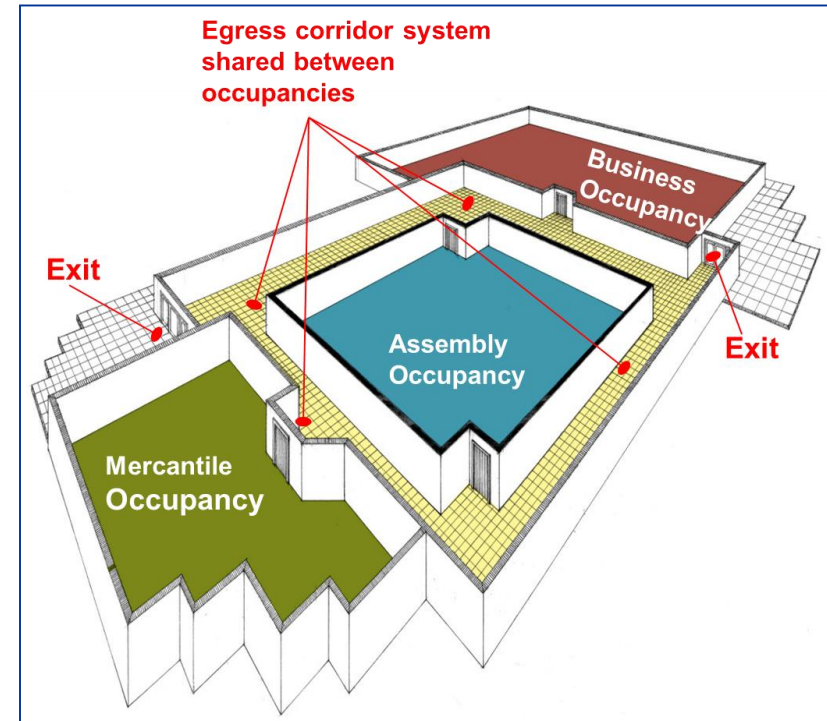
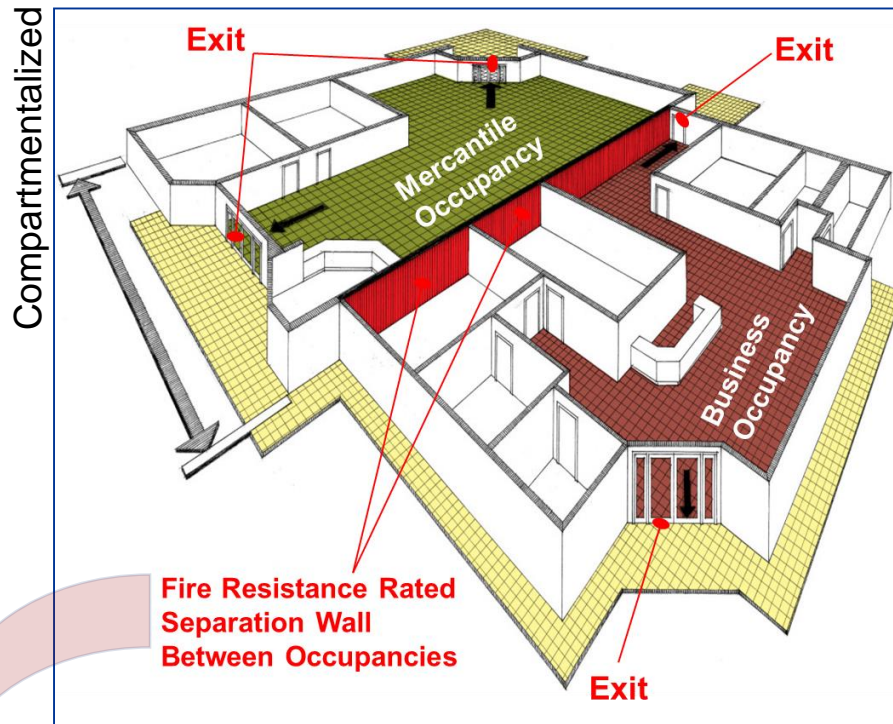
DOOR SCHEDULE				SIZE			DOOR										FRAME					DETAIL
DOOR NO.	FROM	TO	QTY	WIDTH	HEIGHT	THICKNESS	TYPE	ALUMINIUM/GLASS	ALUMINIUM/GLASS-AUTO	GLASS INSULATION-VERT. LIFT	GLASS INSULATION-HORIZ. LIFT	GLASS LITE	TRANSIT DOOR	WOOD-SOLID CORE	POULING COASTER	METAL	PAV	WTE	DOOR	DRIVE ORBULE	ISURE	JAMB
1000	BARBER CENTER	601 SALES	101	11'-11 1/2"	8'-0"	0'-1 3/4"	AA															14
101A		VESTIBULE	150	11'-11 3/4"	8'-0"	0'-1 1/2"	AA															6
101B		VESTIBULE	150	11'-11 3/4"	8'-0"	0'-1 1/2"	AA															6
101C	SALES	101 VESTIBULE	150	11'-11 3/4"	8'-0"	0'-1 1/2"	AA															6
101D	SALES	101 VESTIBULE	150	11'-11 3/4"	8'-0"	0'-1 1/2"	AA															6
151A		BREAK ROOM	116			0'-1 3/4"																
1500000000	RETURN STORAGE	146 CUSTOMER SERVICE	102			0'-1 3/4"																
1500000000		110 BREAK ROOM	116																			
1500000000		110 TRAINING	127																			
1500000000		102 INTERVIEW ROOM	133			0'-1 3/4"																
1500000000		620 SALES	101																			
1500000000		620 SALES	101																			
1500000000		503 SALES	101																			
1500000000		110 BID DATA	146																			
1500000000		109																				
1500000000		126 REC ENVIRO	131																			
1500000000		400																				
1500000000		126																				
1500000000		101																				
1500000000		SALES	101																			
1500000000		SALES	101																			
1500000000		122 REC ENVIRO	131	1	7'-0"	7'-0"	F															
1500000000		146 CASINO ENTIKO	104																			
1500000000		102 HALLWAY	110																			
1500000000		110 TURKEY AIR ROOM	110																			
1500000000		HALLWAY	110																			
1500000000		MEAT UTILITY	526																			
1500000000		CLABNE	131	1	7'-0"	7'-0"	F															
1500000000		SALES	101																			
1500000000		126 MARKADER	143																			
1500000000		112																				
1500000000		110 PERSONEL	134																			
1500000000		131																				
1500000000		131																				
1500000000		131	1	6'-0"	8'-0"	0'-1 3/4"	S2															
171A	OROCERY	102 GENERAL TOILET ROOM	136			0'-1 3/4"																
171A	HALLWAY	110 VOID/STPC	125			0'-1 3/4"																
171B		REC ENVIRO	131	1	8'-0"	8'-0"	0'-1 3/4"	S2														





# Compartmentation

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

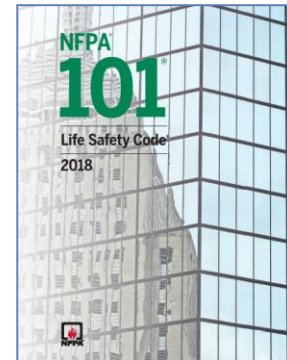
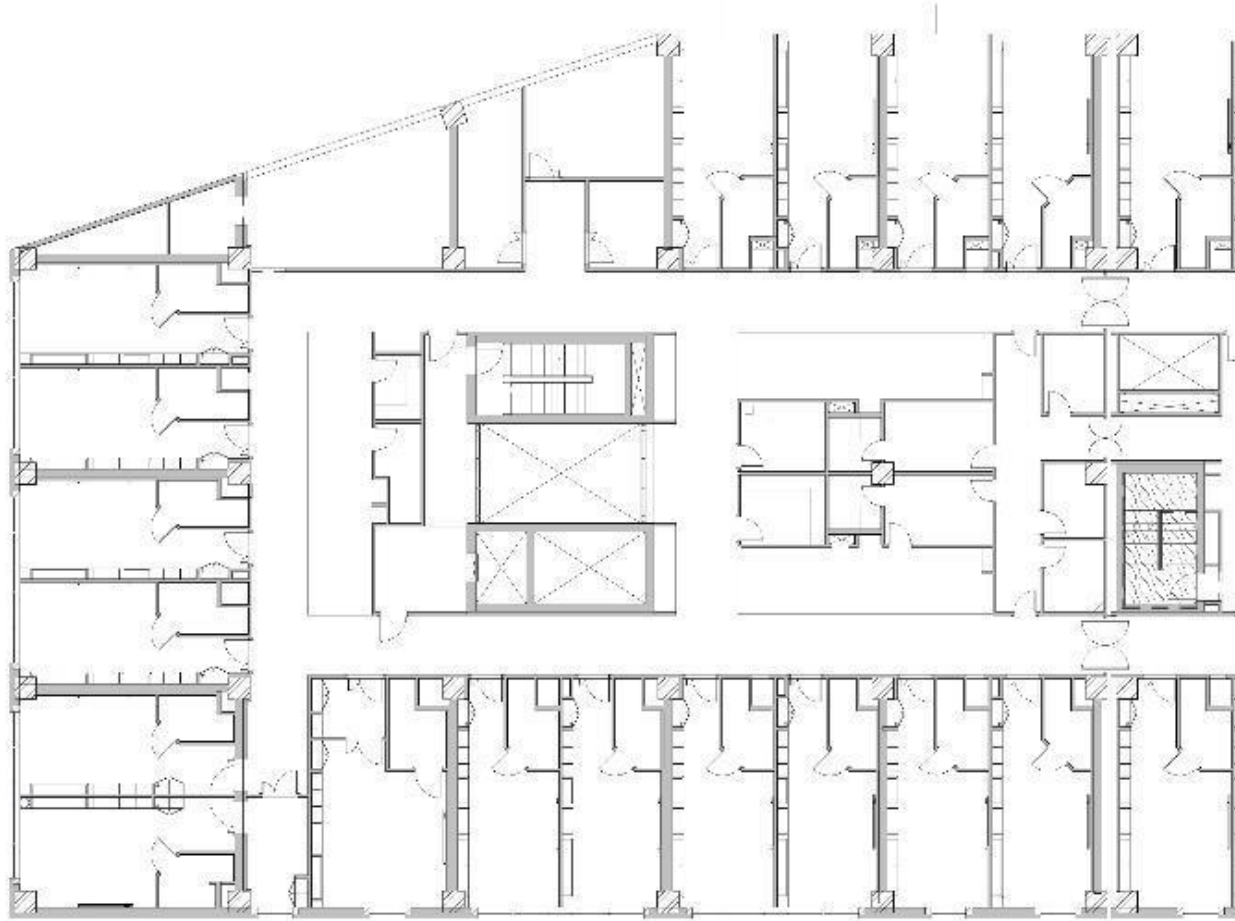


- Hazardous content
- Occupancy separation
- Escape routes
- Vertical Openings
- Compartment Limits

*To Compartmentalize or not, is mandatory for some occupancies by Code, while a designer's strategy for others.*

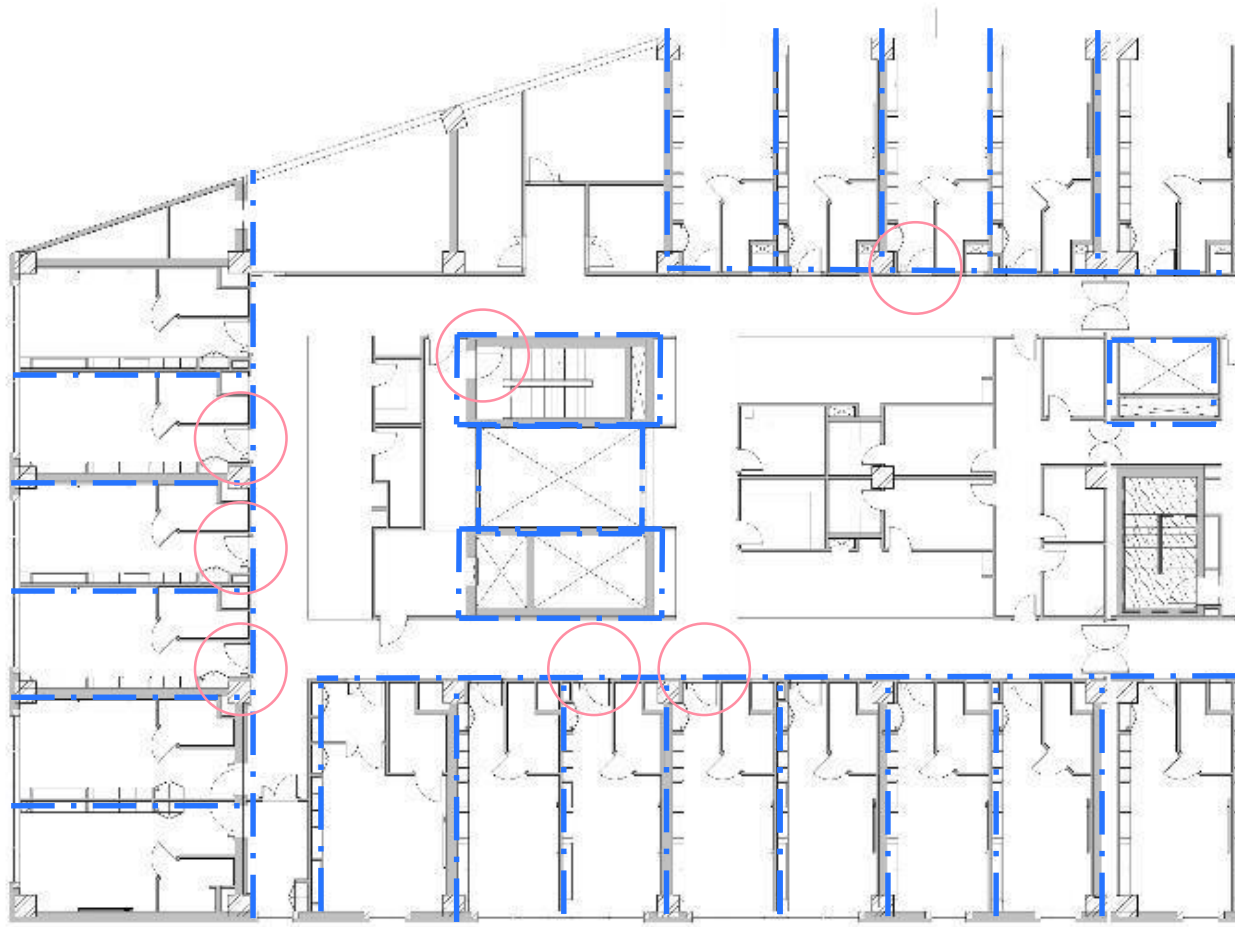
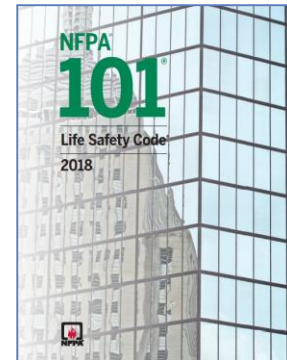
# Compartmentation

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

**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.

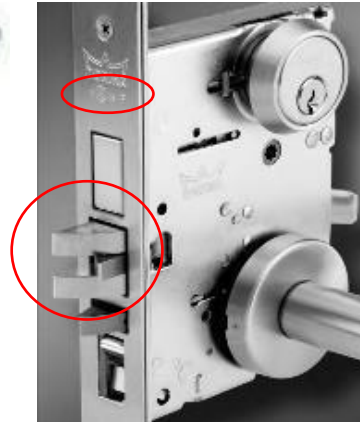
**6.1.3.2.1** Self-closing doors shall swing easily and freely and shall be equipped with a closing device to cause the door to close and latch each time it is opened.

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

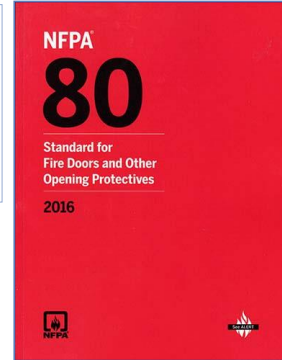
Rated Door Closer



Rated Lock with Latch

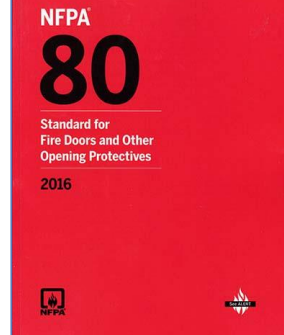
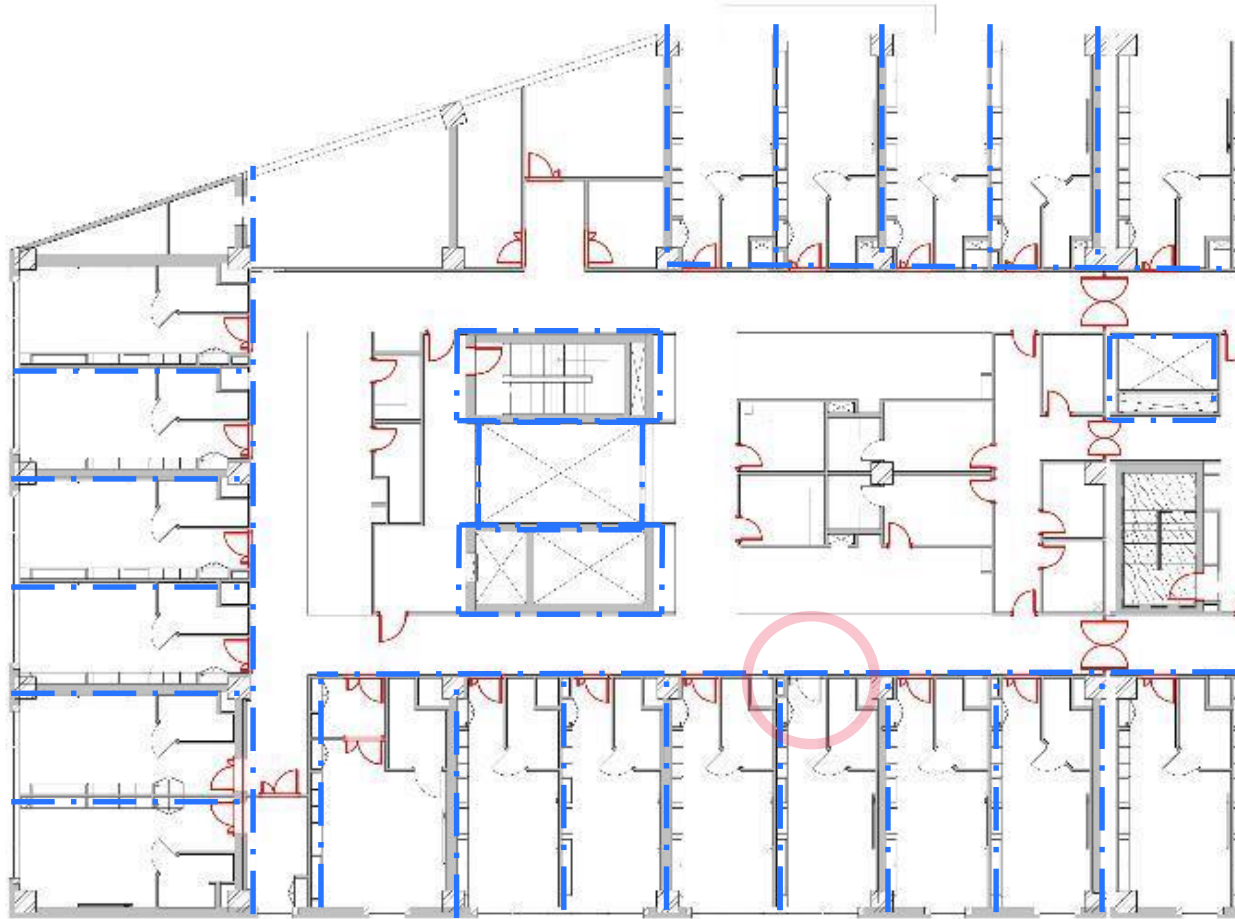


NFPA® 80  
Standard for  
Fire Doors and  
Other Opening Protectives



# Compartmentation

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



# 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

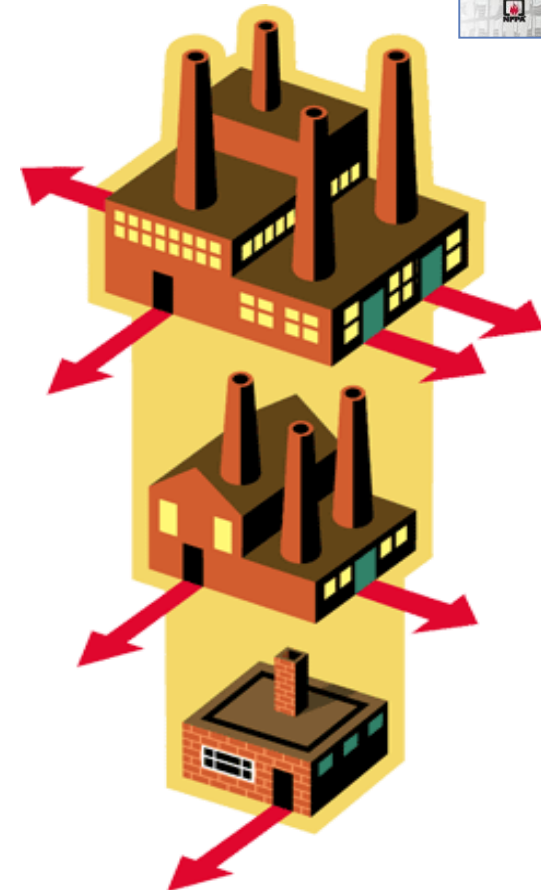
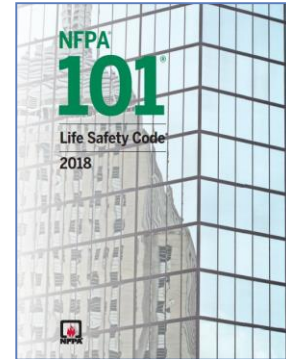
## Health Care Occupancies

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

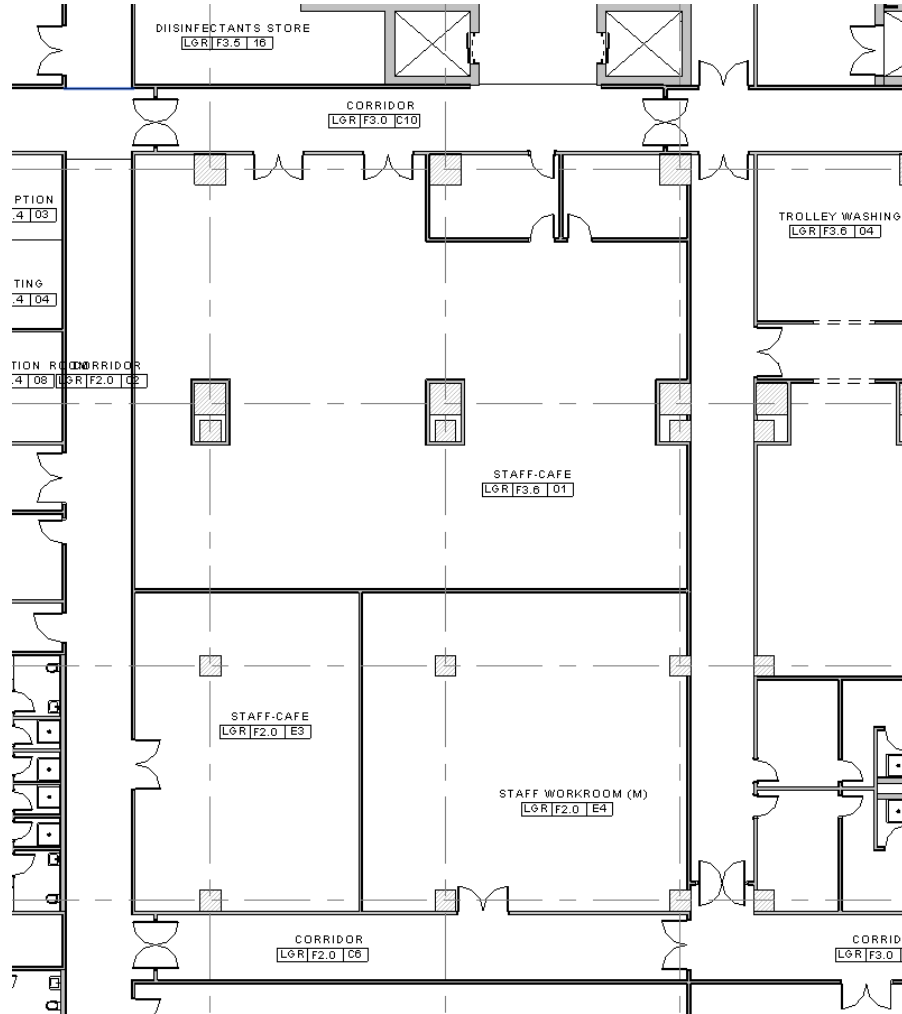
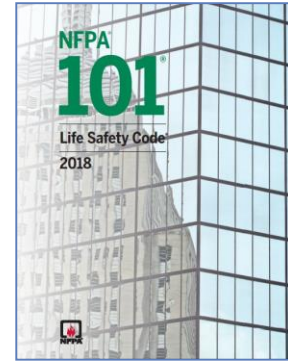
## Storage Occupancies

**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.

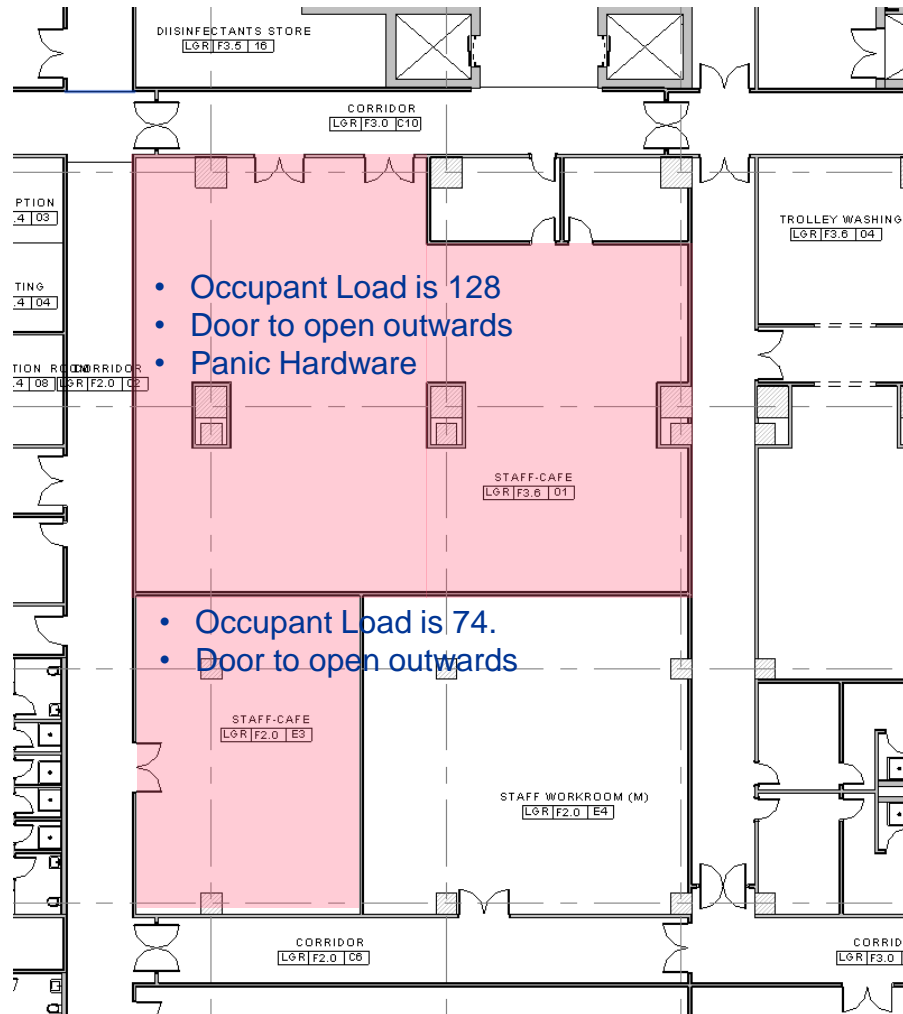
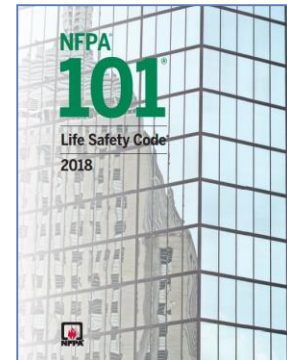


# Occupant Load / Number of Exits



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



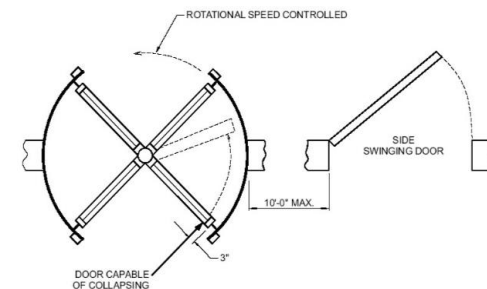
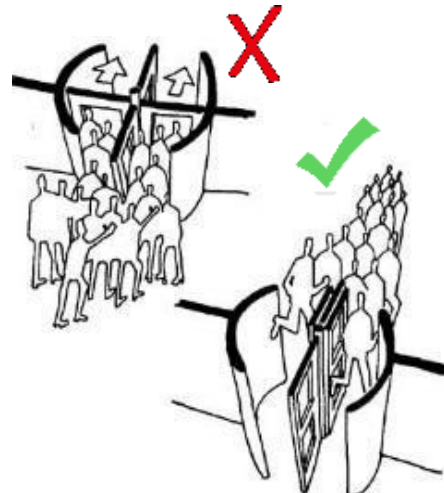
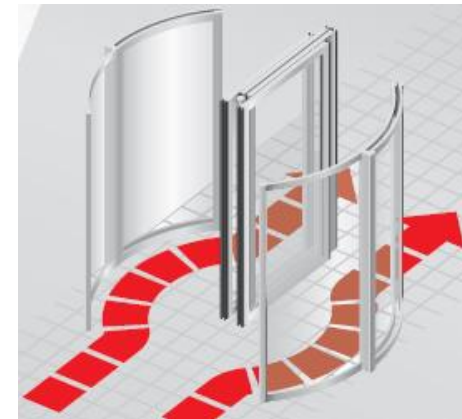
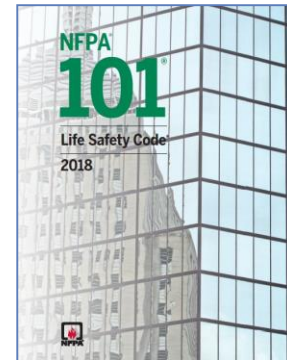
# Egress

## Emergency Exit/Escape doors - Entrance Revolving doors

### 7.2.1.10 Revolving Door Assemblies.

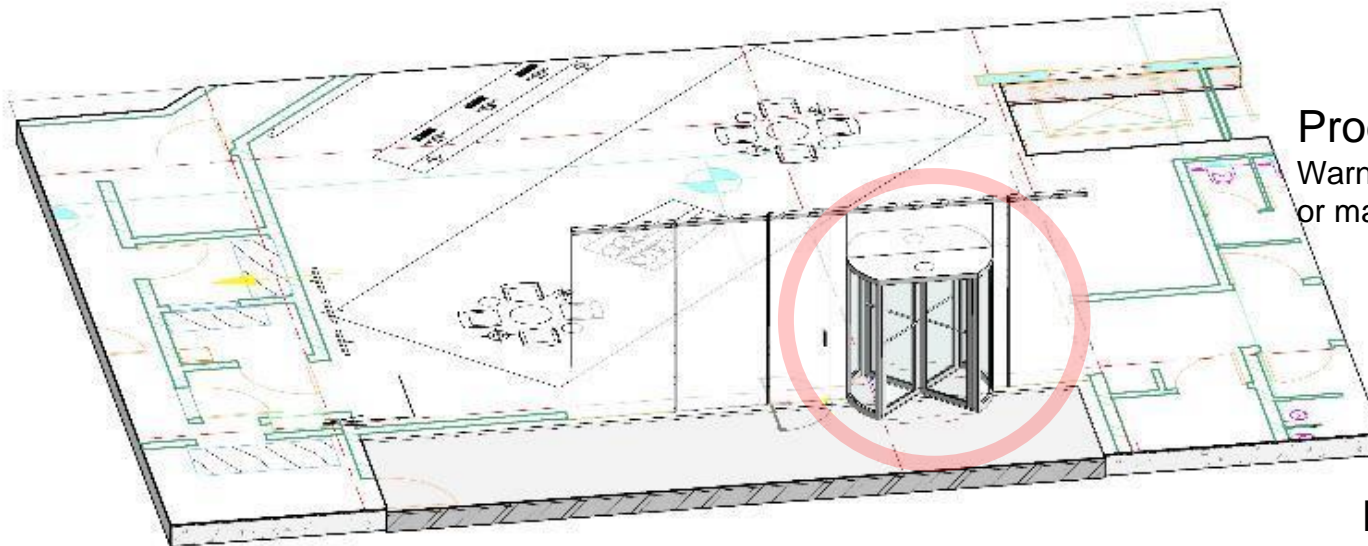
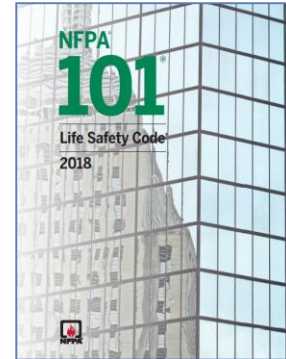
**7.2.1.10.1** Revolving door assemblies, whether used or not used in the means of egress, shall comply with the following:

- (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:



# 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

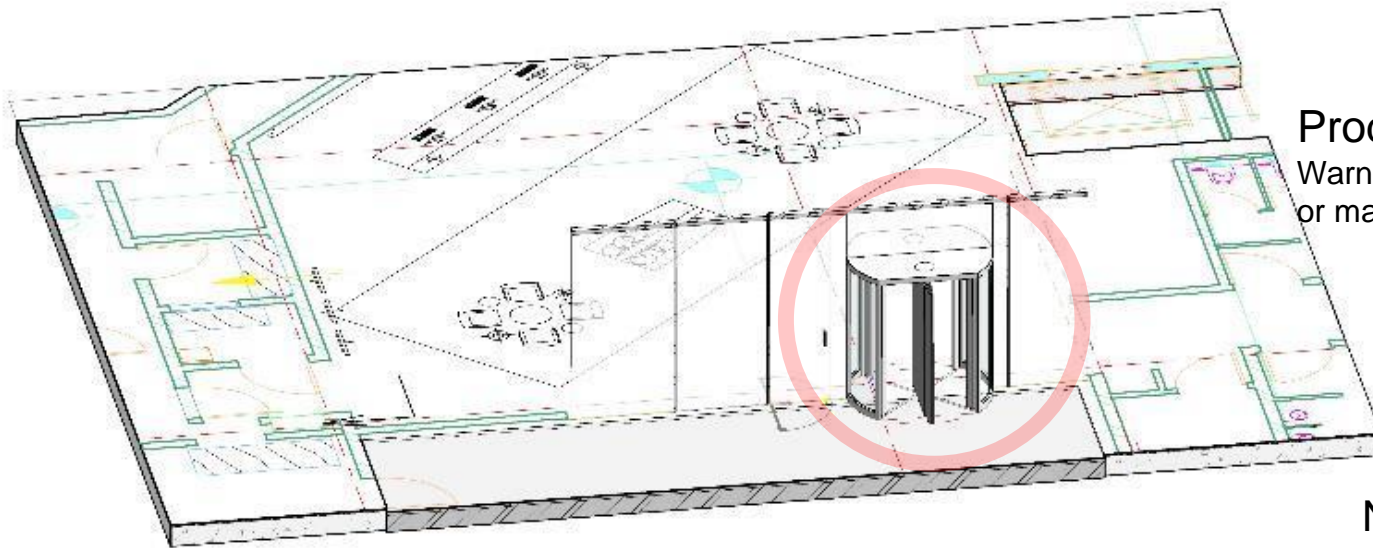
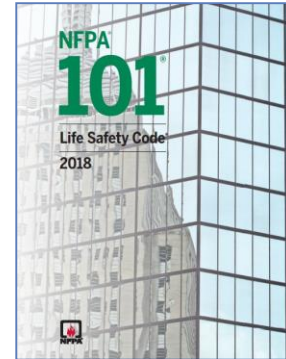
Code Compliance

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

# 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
- ↑ Objects selection



# BIM

nbs & BIM 5D Video



## Thank you

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



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

