

Egress Elements

- Explain the purpose of the means of egress
- Distinguish between the three elements of the means of egress



Historic Fire

- Happy Land Social Club



Means of Egress

- Chapter 7 of NFPA101
 - Chapter 10 of IBC
 - Fundamental to life safety

1. nfpa 101 and IBC are not identical .but the concepts and principles that underly everything are the same in the two codes
2. most content for nfpa 101 and for PE
3. we should be familiar with



Means of Egress Requirements

- Level
 - Not more than $\frac{1}{4}$ in
 - More than $\frac{1}{2}$ in change in level
 - Clearance
 - 7 ft 6 in
 - 6 ft 8 in
 - Slip resistant
 - No obstructions
1. Make sure everyone can use all these means of egress avoid pump(碰撞) and one person goes down and people end up being stacked up on top of each other and they can not get out
2. we want to do something to avoid slip trips and falls



Egress Elements

- **Exit**
 - Meaning
 - Examples



Egress Elements

- **Exit Access**
 - The portion of a means of egress that leads to an exit.
- **Exit**
 - The portion of a means of egress that is separated from all other spaces of the building or structure by construction, location, or equipment as required to provide a protected way of travel to the exit discharge.
- **Exit Discharge**
 - The portion of a means of egress between the termination of an exit and a public way.



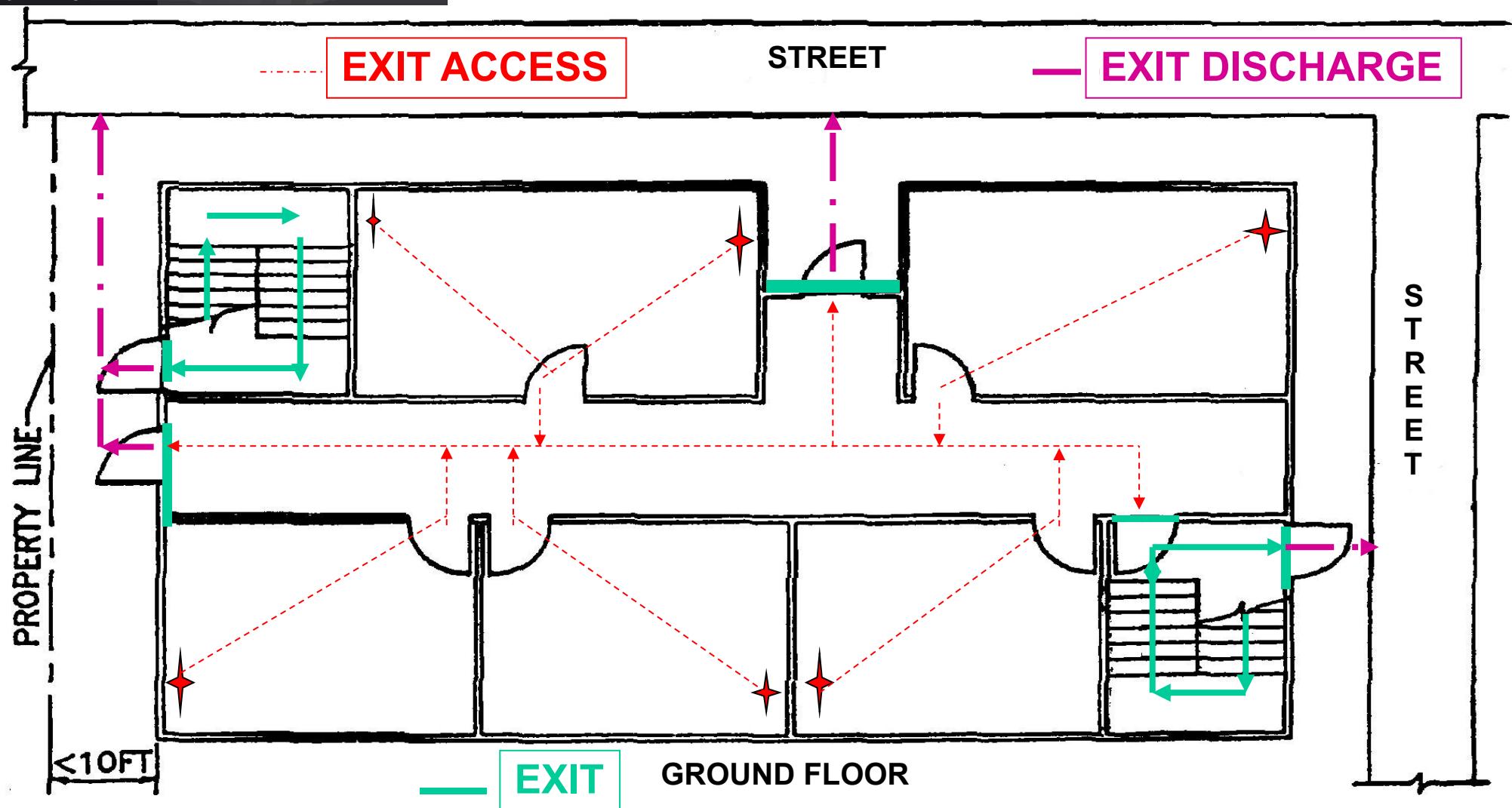
Egress Elements

- **Public Way**
 - A street, alley, or other similar parcel of land essentially open to the outside air deeded, dedicated, or otherwise permanently appropriated to the public for public use and having a clear width and height of not less than 10 ft.
 - The code intends a situation where occupants egressing from a building ultimately reach a point where they can move away from the building unimpeded and no longer need the protection of the Code.



Egress Elements

...you see a door leading out well a few doors leading out to an area that's less than 10 feet to the property line so another building could be built there so that cannot be the public way



Decreasing Hazard

- From corridor to a room
- From one room to another room
- Through kitchens
- Through mechanical rooms
- Exit to exit access
- Exit to lobby
- Stairs directly to outside





door leaning to the
unrated corridor that's
not quite seen here also
exit access



exit access



rated corridor
and I lead people
outside
discharging
directly this is
rare now





exit, not because signs but when fire happened it activate the magnet on those door providing a fire barrier. we will see this in a lot of institutional space like hospital. so this is horizontal exit give protection





exit, inside
rated enclosure.
most stair you're
going to see in
the building are
exit stairs





exit lead to
outside



one way exit





exit discharge





exit discharge





Exits

- Calculate the number of exits required
- Explain how the exit should not be used

You should be dependent on a single safeguard

In general rule you should have at least two exits because if a fire blocks one exit you still have a way out of building



Historic Fire

- Rhythm Nightclub



Number of Exits

- Based on the number of people
 - Not dependent on type of occupancy
- Assume single exit could be blocked
 - 50 %

The calculation method is to determine the gross floor area, and then find the occupant load factor of the corresponding occupancy in the table 1004.1.2.

Secondly, through the number of occupants, I can determine the design number of exits: (1) 50 to 500 occupants: two exits. (2) 501 to 1000: Three or more exits. (3) More than 1000 occupants: Four exits. Thirdly, I learned to design the width of the stair, the width of the corridor and the width of the door through the number of people.

the general rule is two is a minimum. So no answer below too on the exam will be correct. Example 499=2 exits, 501=3 exits





Horizontal Exit



Exit Usage

- Fire protection systems only

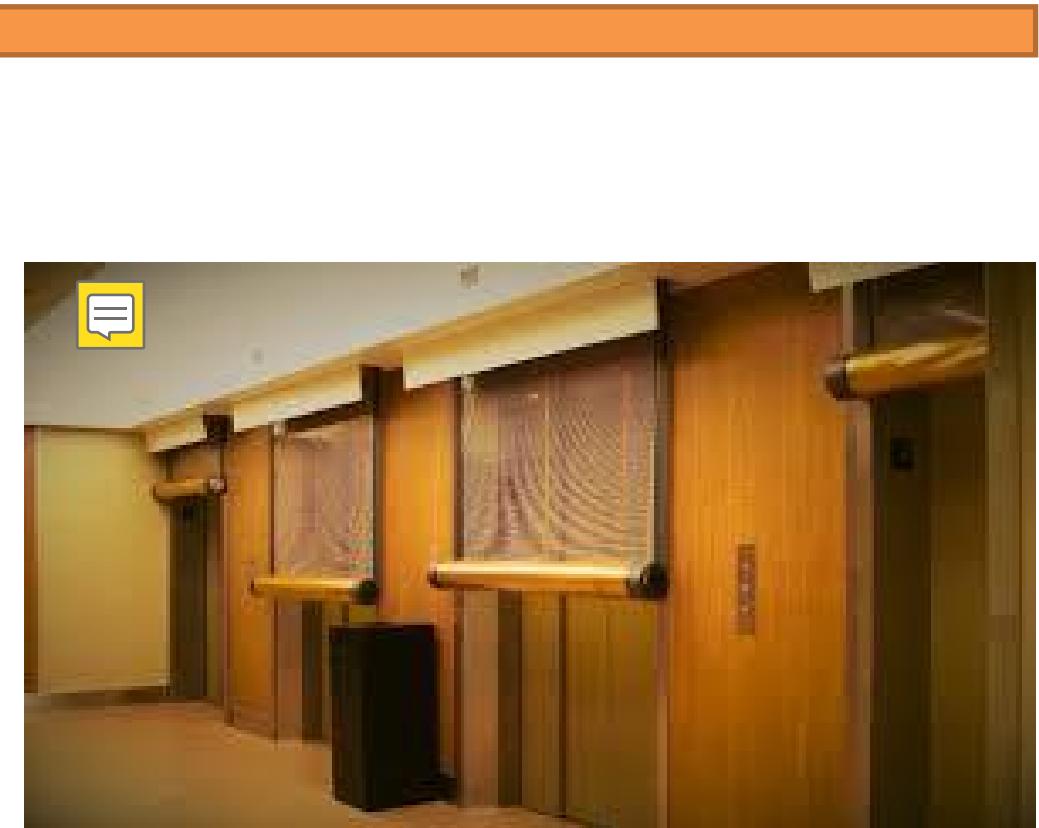




Maintenance of Exits



Enclosures





Doors and Corridors

- Calculate the minimum size of doors and corridors
- Identify the features of doors and corridors



Historic Fire

- Hartford Hospital



Minimum Widths

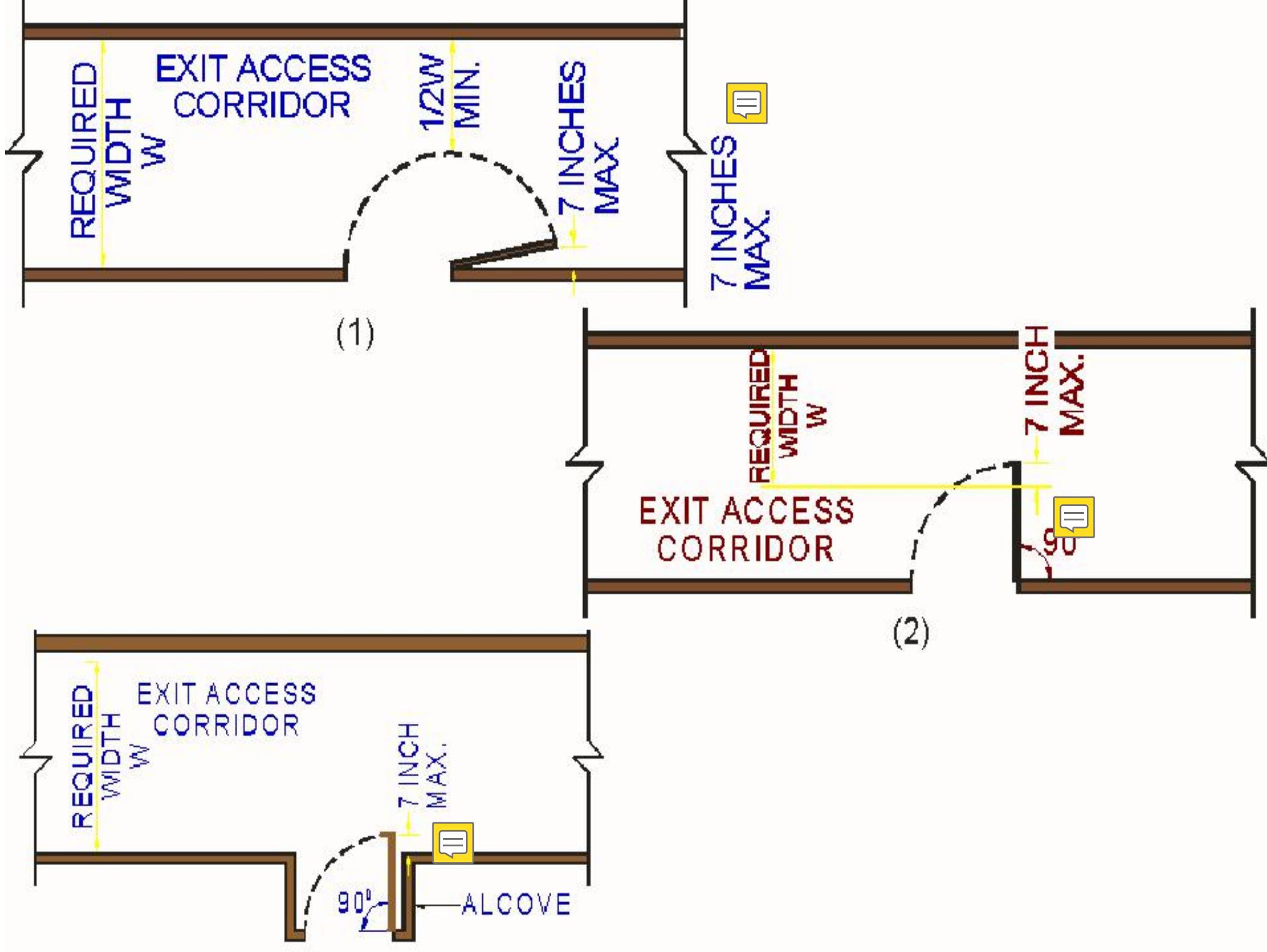
- NFPA rules
- IBC rules



Minimums

- Access: 36 in
- Doors:
 - Clear width
 - 28 in
 - 32 in
- Cannot decrease in direction of travel





Doors

- Direction
- Hardware
- Locks
 - Delays
- Forces
- Labels



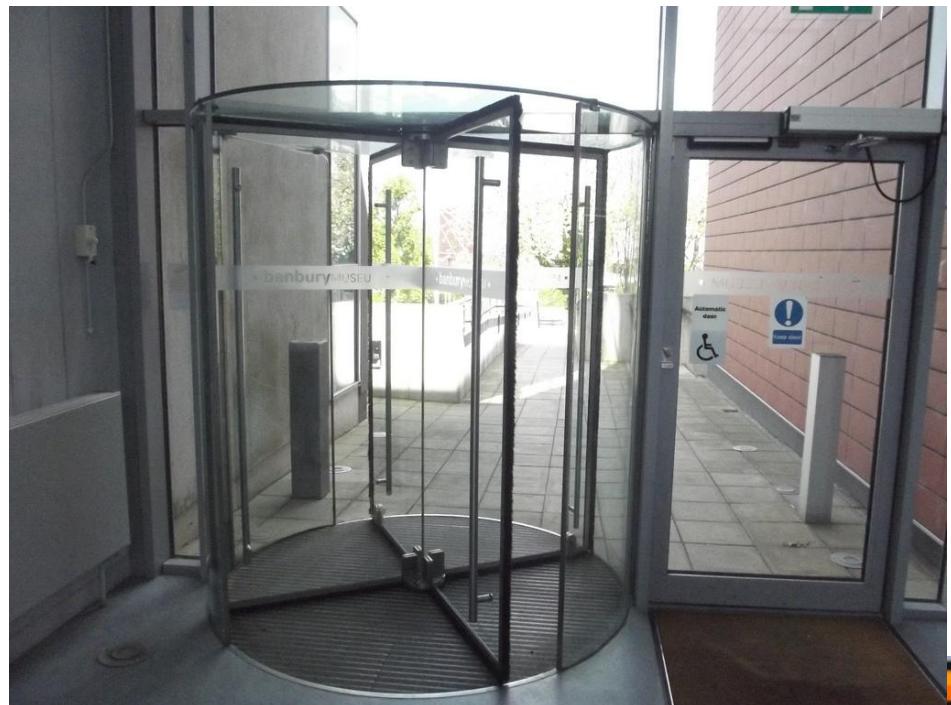
Doors

- Automatic-closing
- Self-closing
- Level
 - Width of leaf on either side
- Egress side
- Ingress side



Revolving Doors

- Typically not include in means of egress
- Must have regular doors adjacent
- Doors must break-away in direction of travel
- Rules on speeds



Doors

- Single action
 - No special knowledge
 - No special tools
- Lock side based on security



Other Components

- Identify other elements that can be part of the means of egress
- Determine when other components are appropriate to use



Historic Fire

- MGM Grand

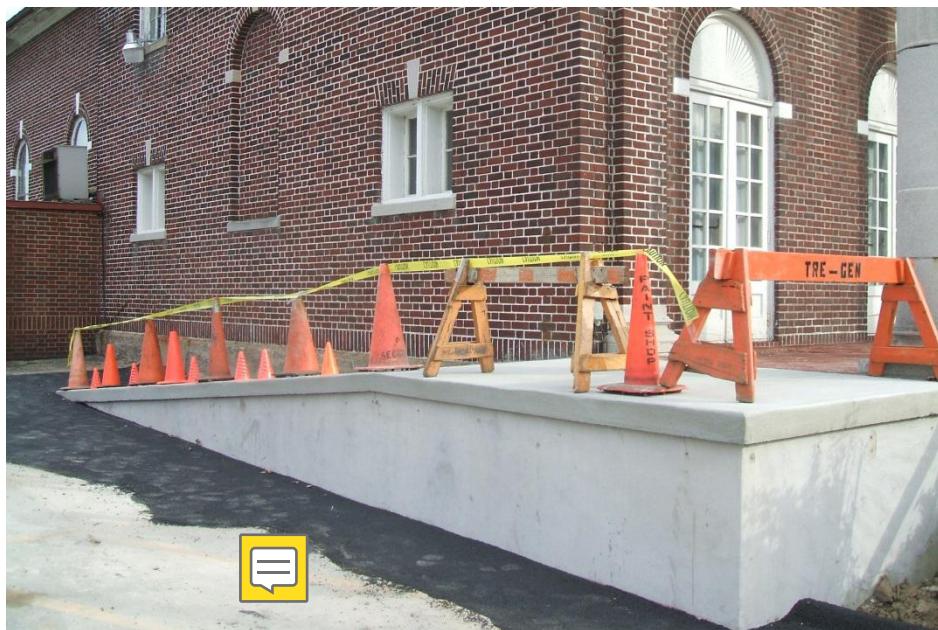


Others

- Areas of Refuge
 - Area to wait
 - Connected to means of egress
 - 2 way communication
- Smoke Proof Enclosure
 - Outside building
 - Protected shaft

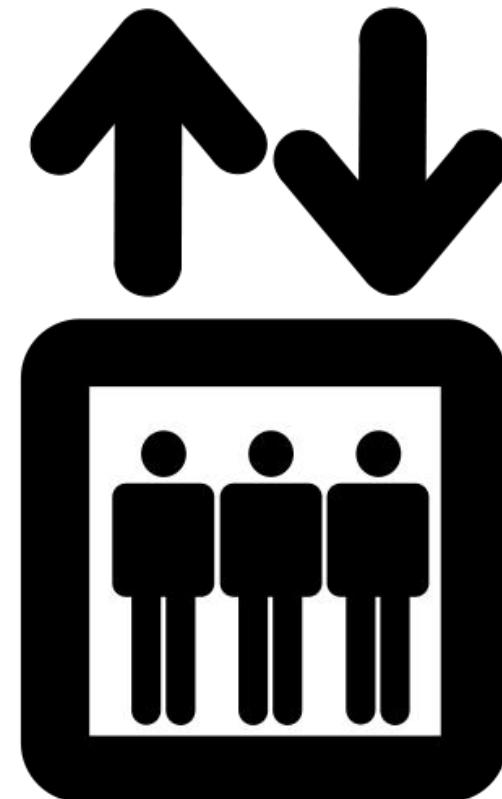


Others



Others

- Before Phase I
- Stair replacement?
- Shaft with stair
- Signage
- FFCP
 - 2 way communication
- Building must have
 - Voice alarm
 - Sprinklers

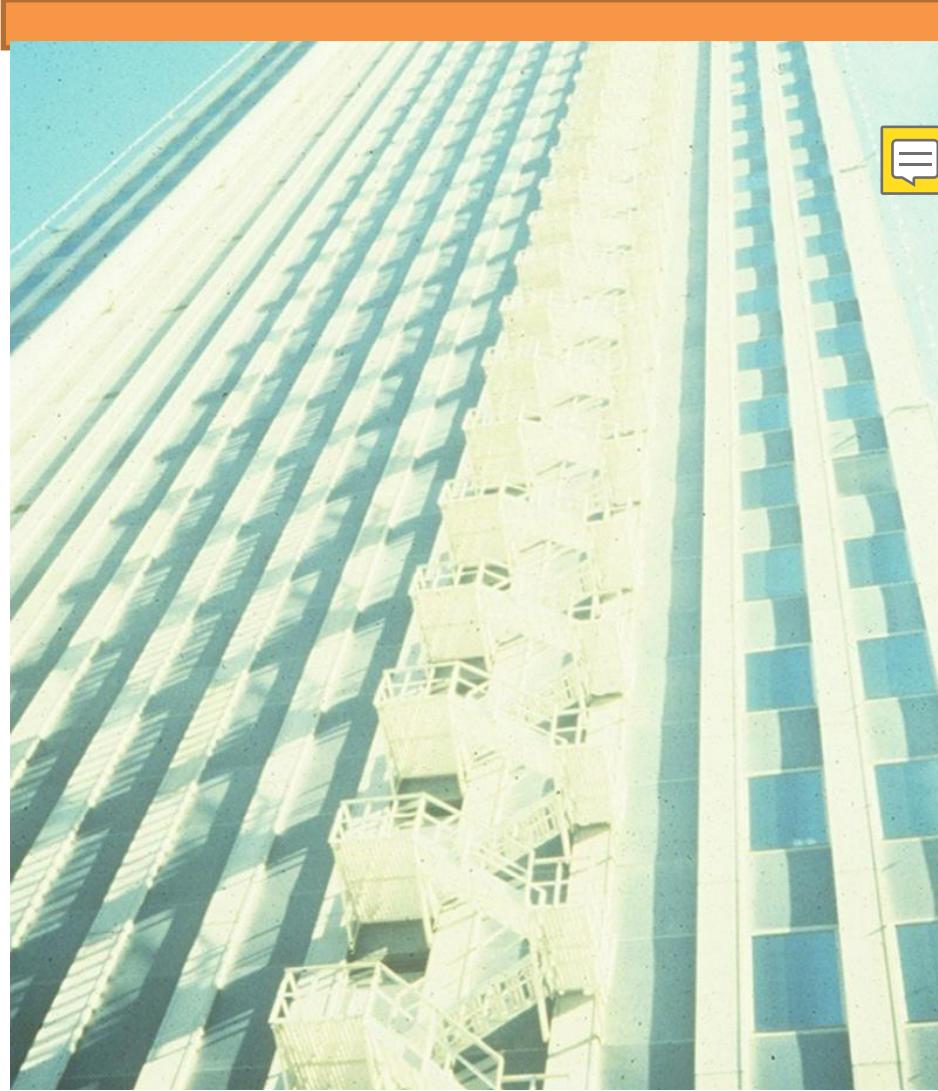


Others



1. training on that
2. limit number of people

Others



Supplementary Escape Devices



Stairs

- Calculate the **minimum size of stairs**
- Identify the **features of stairs**



Historic Fire

- Grenfell Tower



Stairs are Simple

<https://themindcircle.com/30-epic-stair-design-fails/>



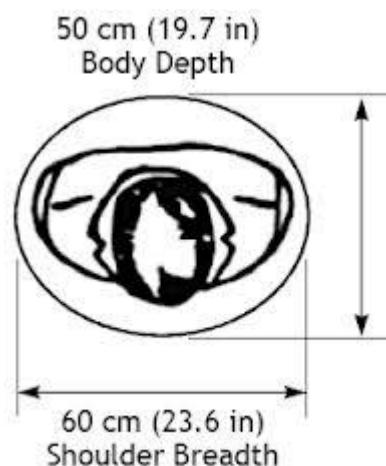
Stair Widths

- **Exit lanes**
 - Not used by NFPA101 or IBC
- **Width calculations**
 - NFPA
 - IBC

$$C = 146.7 + \left(\frac{Wn - 44}{0.218} \right)$$

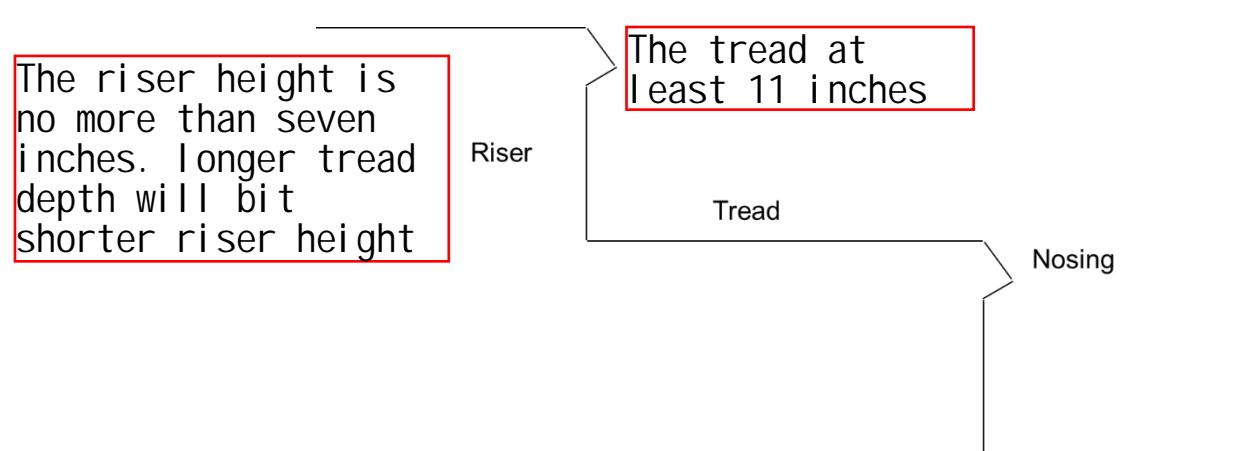
146

Width<44 in, use 0.3
Width>44 in, use 0.218



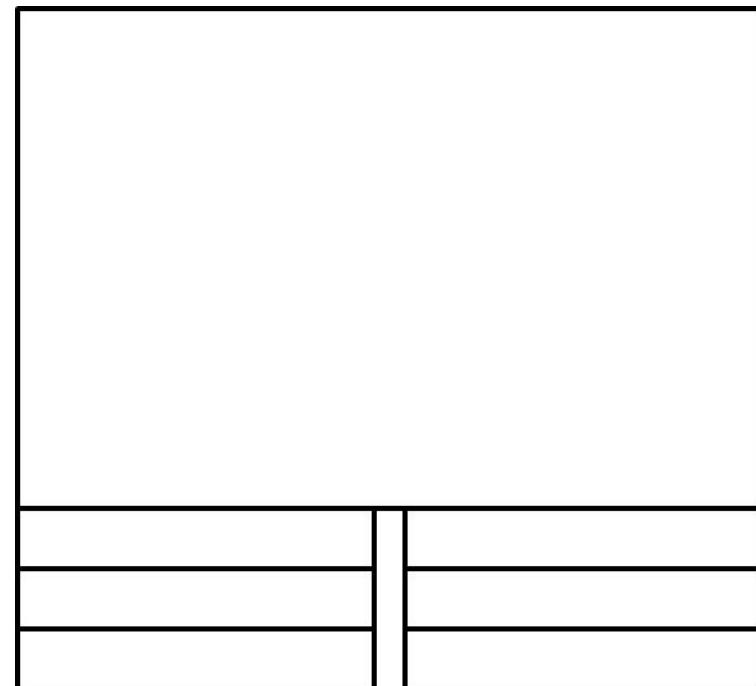
Stairs

- Size
- Usage
- Slip resistant
- Marked
- Changes in size
 - 3/16 in
 - 3/8 in



Stair Terminology

- Flight
- Landing
- Dog-leg
 - Sinistral 左旋的
 - Dextral 右旋的
- Straight
- Curved
- Spiral



Curved and Spiral Stairs



Minimums

- 44 in
 - Exception 36 in
- 56 in
- Cannot decrease in direction of travel
- Projections
- Fire alarm



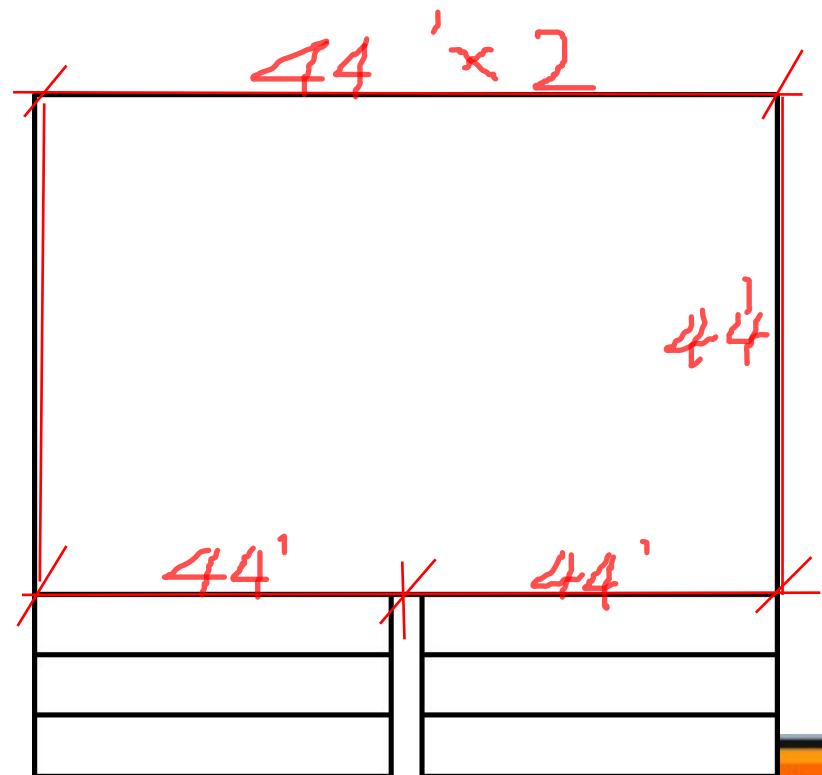
Handrails and Guards

- Shape
- Location



Landings

- No decrease in width
- Length equal to width of stairs
 - 48 in
- At doors



Convenience Stairs

- Uses
 - Atriums
 - Grand stairs
- Connecting multiple levels
- General
- With sprinklered vertical openings

中庭
大樓梯



Occupant Loads

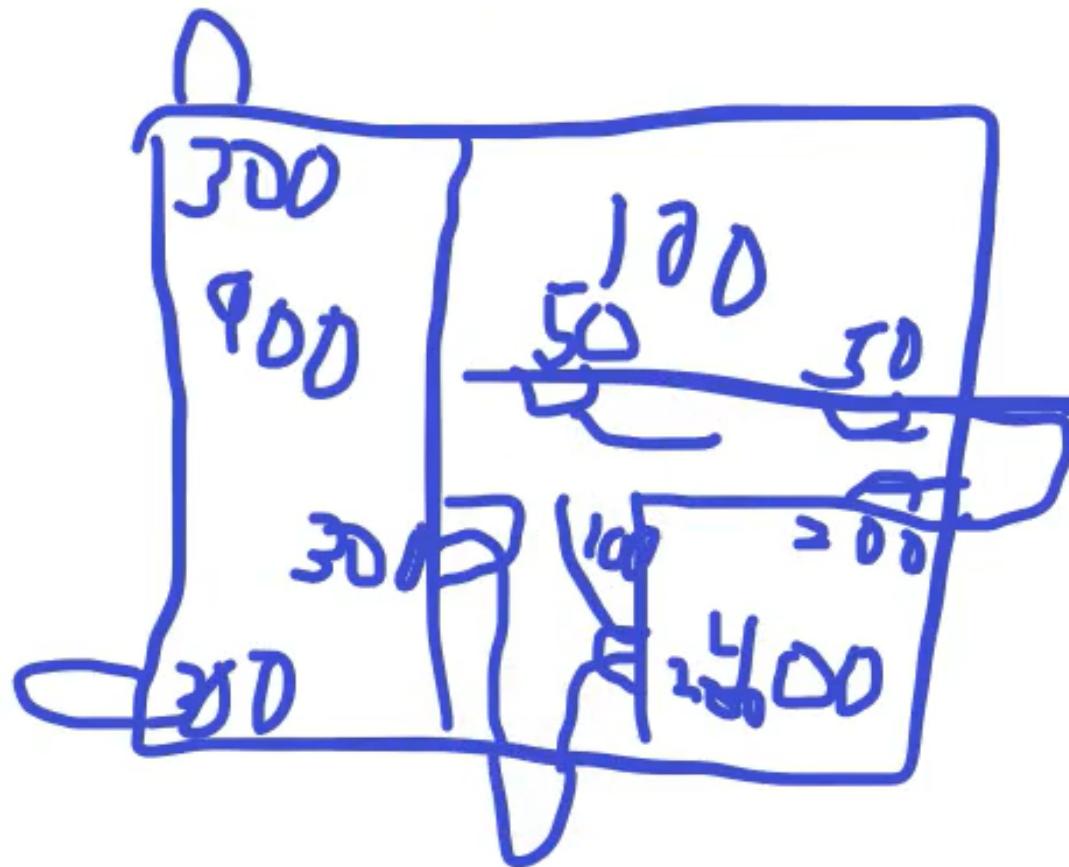
- Select the appropriate number of people per exit
- Determine the capacity of areas with merging flows

选择每个出口的适当人数
确定合并流区域的容量



Historic Fire

- Dusseldorf Airport





Assigning Exits

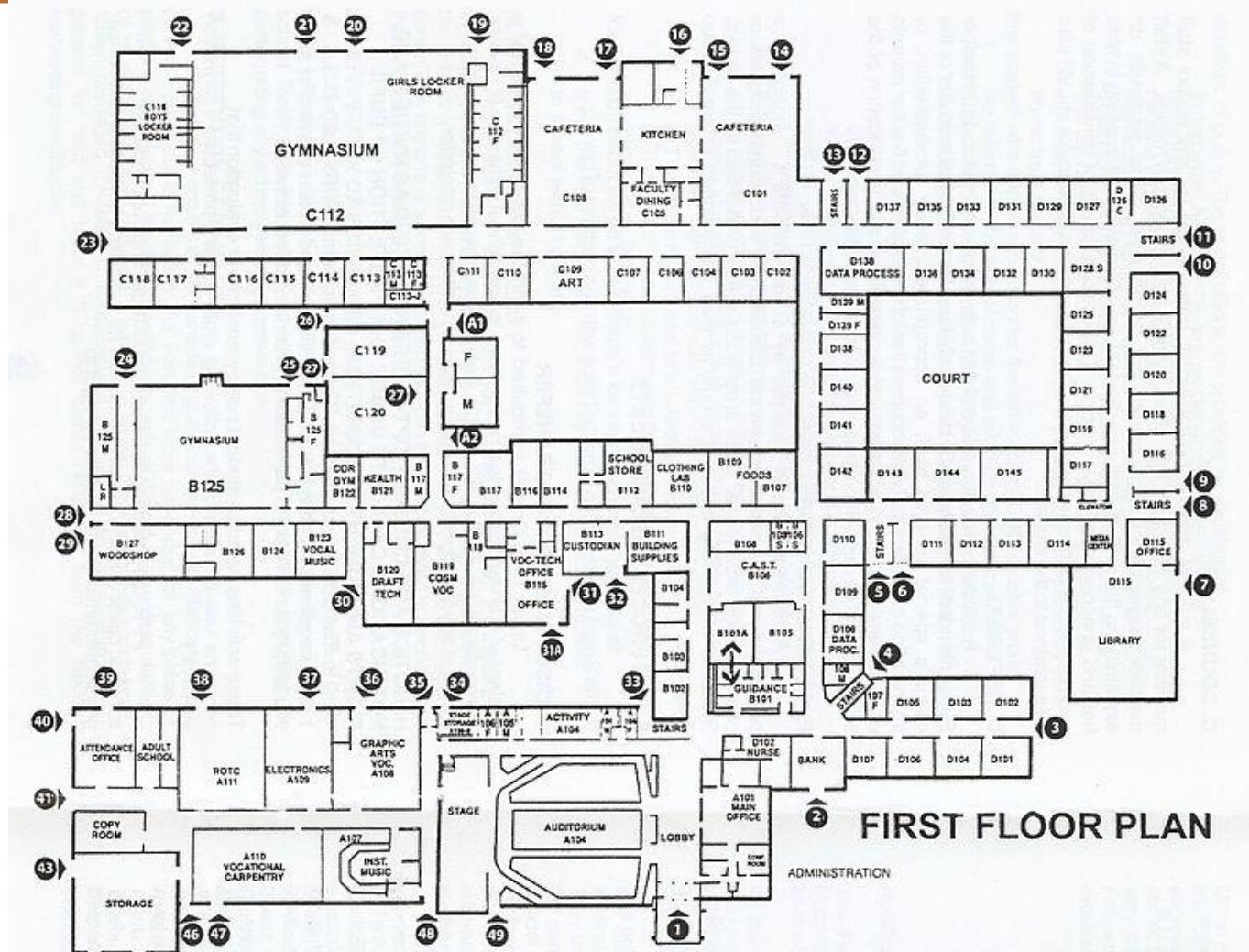
Department store: 20,000

Skating rink: 5,000

Restaurant: 11,000



Simultaneous Occupancy



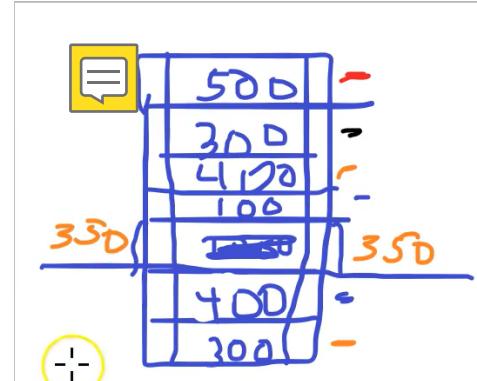
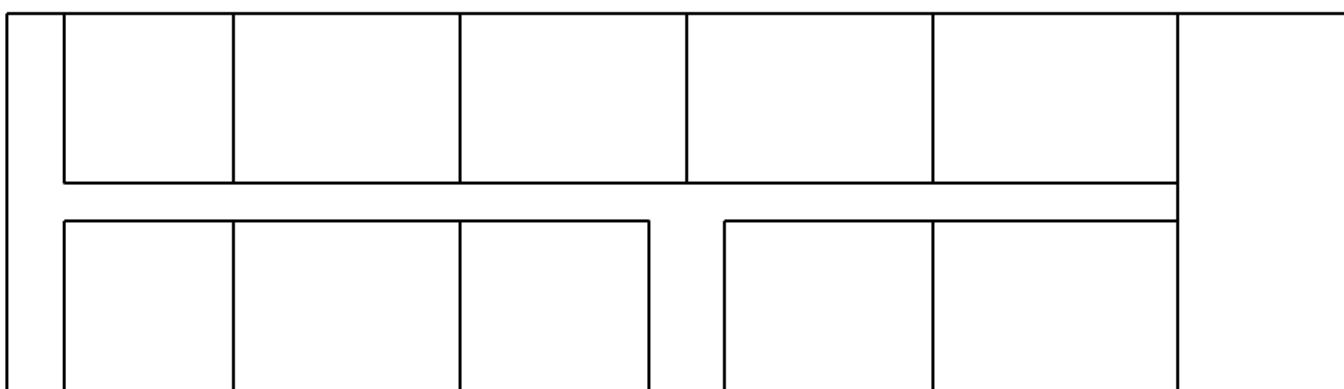
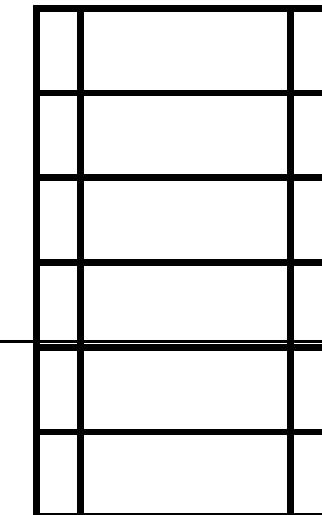
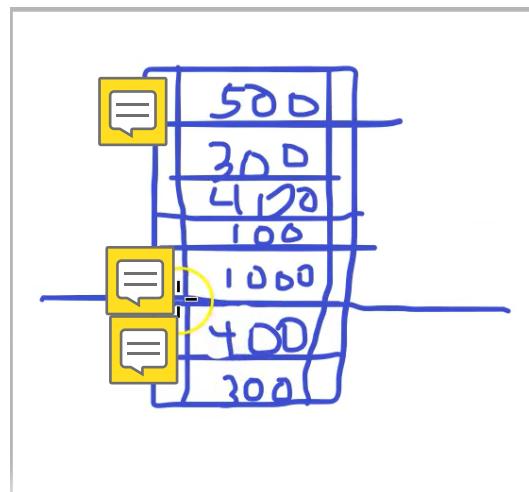
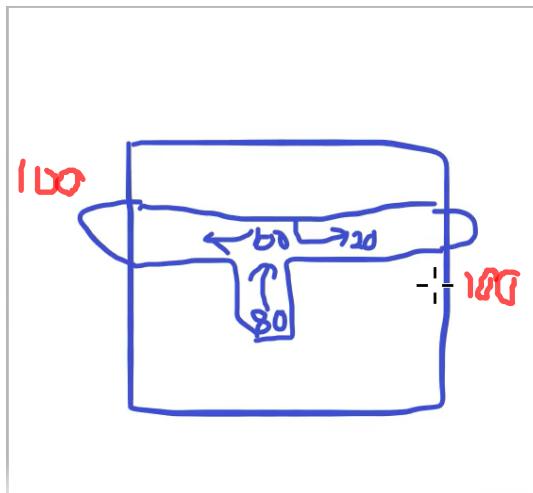
Evacuation Elevators

- 25 % population + 2 % wheelchairs



Merging Flows

- Corridors
- Stairs



Occupant Loads

- Select the appropriate choice between gross and net area
- Calculate the occupant load



Historic Fire

- Ghost Ship



Occupant Load Factors

- Gross
- Net
- Mixed use

Table 7.3.1.2



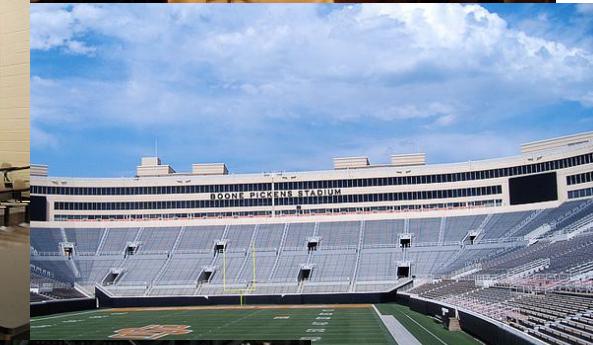
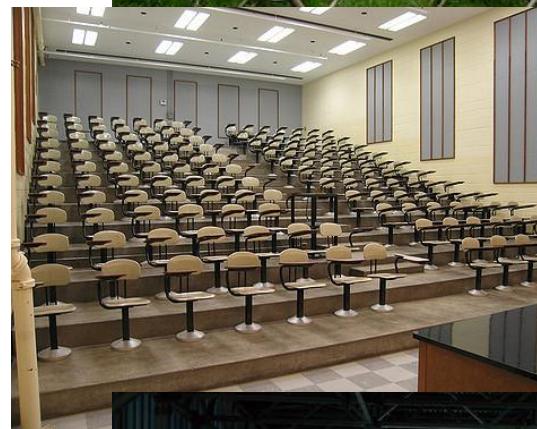
Occupant Load Factors

- Minimum design value
 - Are more people acceptable?
- Origin of load factors
- Meaning of words
 - Based on use
- Rounding rules



Seating Arrangements

- Concentrated
- Less concentrated
- Fixed
- Bench
- Waiting spaces



Malls

- Load factor varies with size of mall



Exits

- Determine the remoteness of exits
- Calculate the capacity of exits



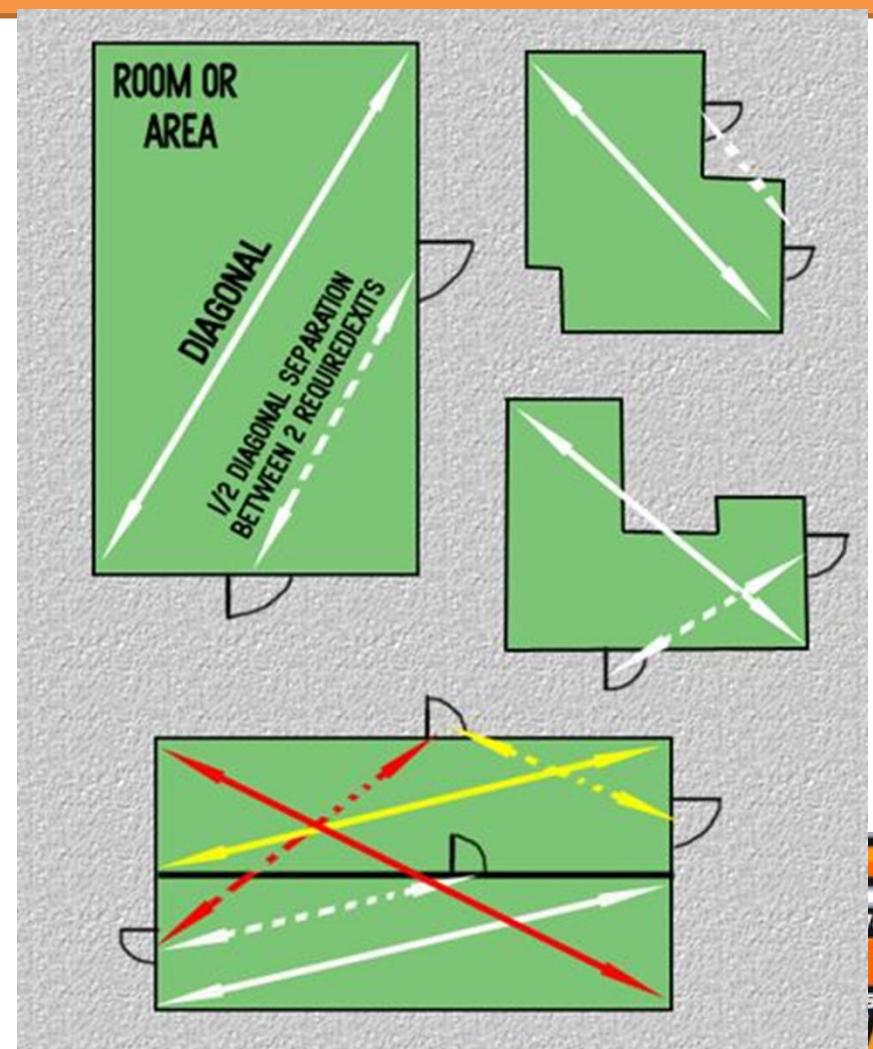
Historic Fire

- Katie Jane Memorial Home



Remote

- Rules for two exits
 - Additional exits as far apart as is practical
- Sprinkler trade-off
- No familiarity requirements



Requirements

- Openings from normally occupied spaces
- Rating depends on building height
 - 1 hr for 3 stories or less
 - 2 hr for 4 stories or more



Discharge

- Remote
- All outside
 - 50 % in some instances
- Barrier



Capacity

- Typically for existing buildings
 - Change of use
 - Reconstruction on floor
- Look for limiting component
 - More to consider than just the first component
- Rounding



Distances

- Determine where distance calculations are required
- Calculate distances
- Explain the limits on dead end corridors and common path of travel



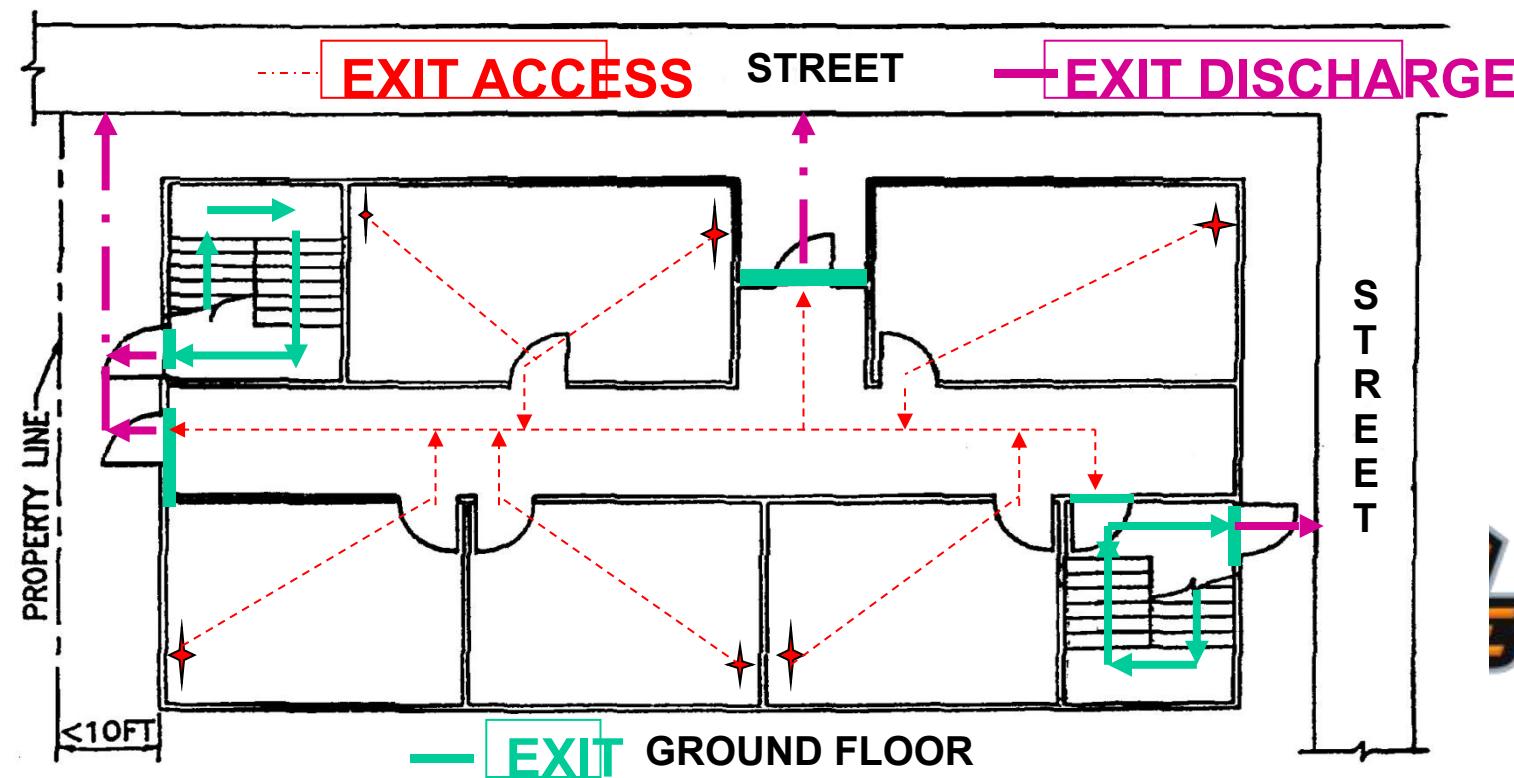
Historic Fire

- Beverly Hills Supper Club



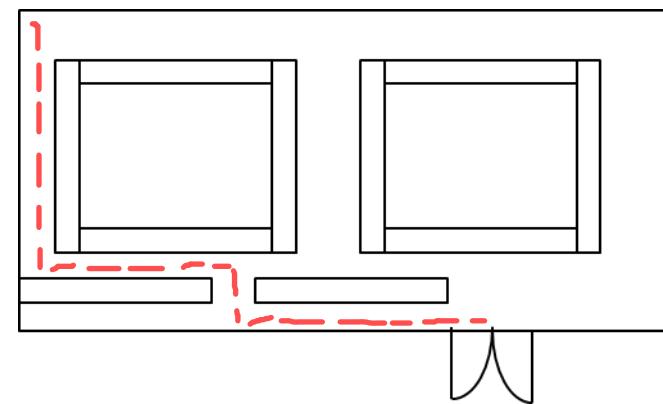
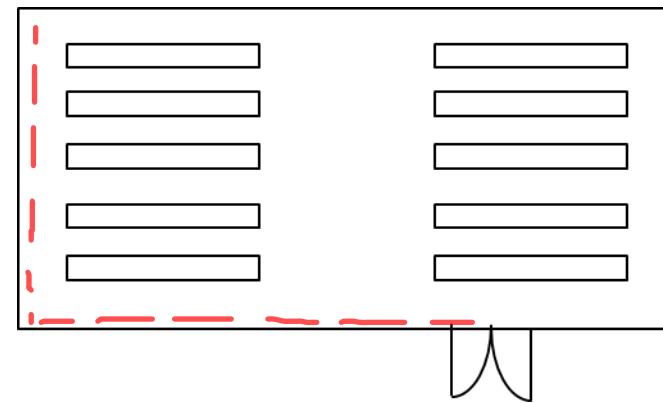
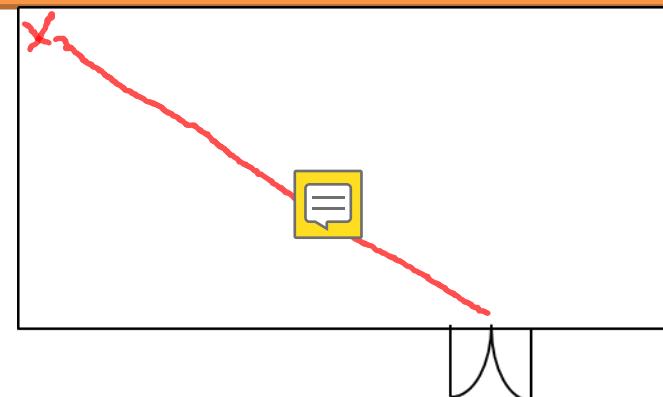
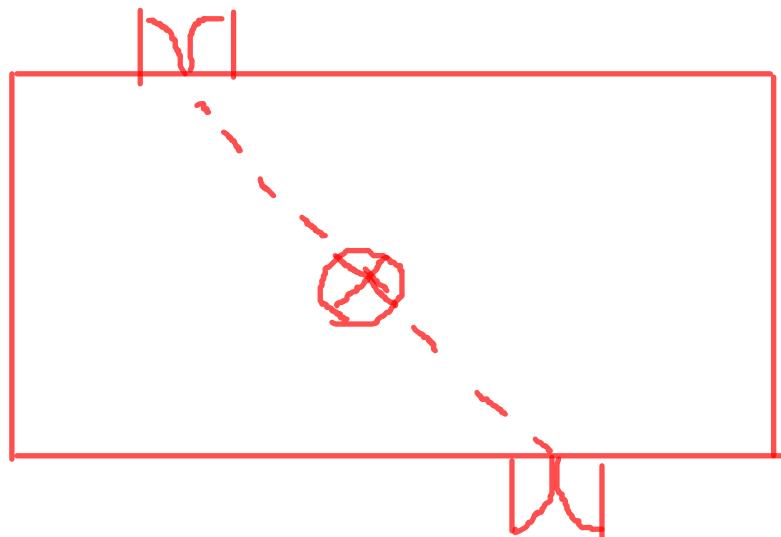
Travel Distance

- When to measure
- Two paths



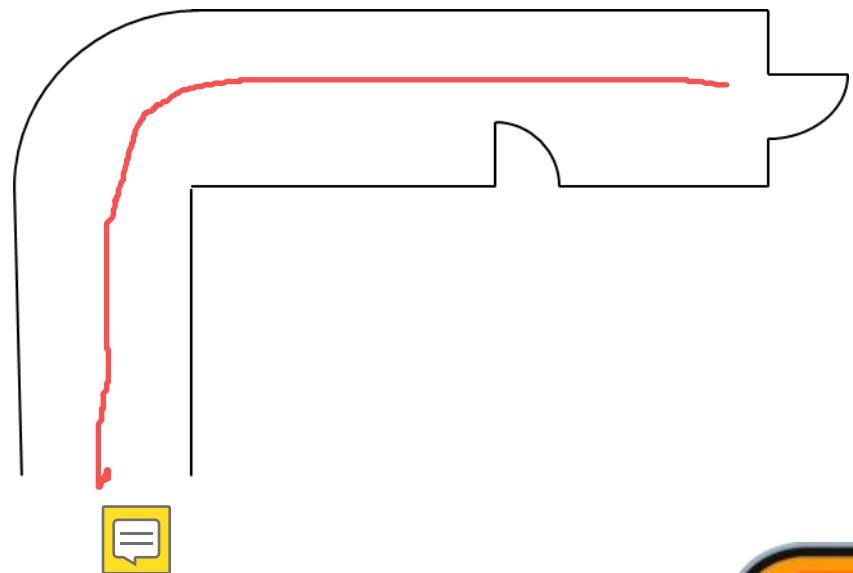
Rooms

- How to measure



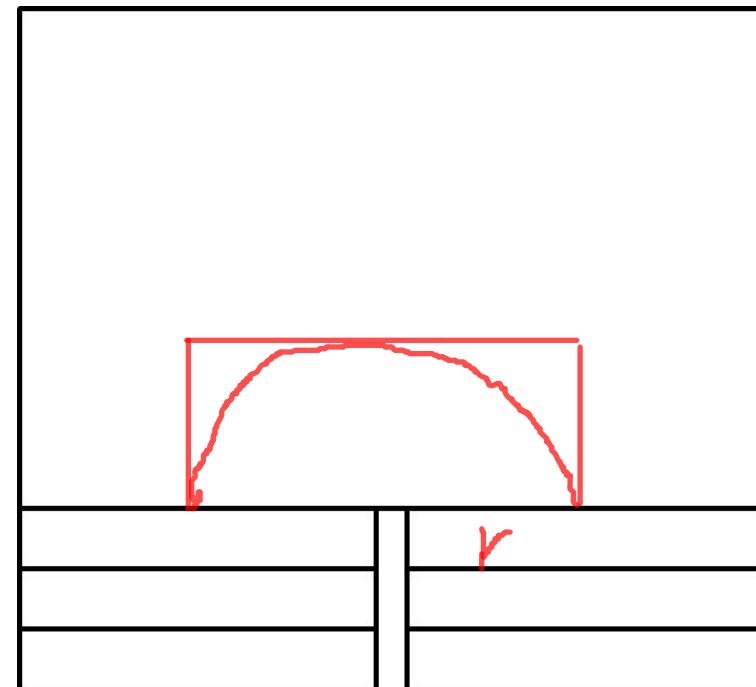
Corridors

- Natural path
- Minimum 12 in clearance around curves/obstructions
- To exit
 - Door



Stairs

- On treads
- On landing



Areas of Concern

- Dead End Corridors
- Common Path of Travel

