

Egress

1. Calculating occupancy load

TABLE 1003.2.2.2
MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT¹

OCCUPANCY	FLOOR AREA IN SQ. FT. PER OCCUPANT
Agricultural building	300 gross
Aircraft hangars	500 gross
Airport terminal	
Concourse	100 gross
Waiting areas	15 gross
Baggage claim	20 gross
Baggage handling	300 gross
Assembly	
Gaming floors (keno, slots, etc.)	11 gross
Assembly with fixed seats	See 1003.2.2.9
Assembly without fixed seats	
Concentrated (chairs only— not fixed)	7 net
Auditoriums, churches and chapels, dance floors, lobbies	5 net
Standing space	15 net
Unconcentrated (tables and chairs)	
Conference rooms, dining rooms, drinking establishments, gymsnasiums, lounges, and stages	
Bowling centers, allow 5 persons for each lane including 15 feet of runway, and for each additional area.	7 net
Business areas	100 gross
Courtrooms— other than fixed seating areas	40 net
Day care (for children or the aged)	35 net
Dormitories	50 gross
Educational	
Classroom area	20 net
Shops and other vocational room areas	50 net

Note:

Net & Gross are undefined terms.

Net: small areas (occupants area) – (building elements)

Gross: large areas fixed elements are used for area calculations – shafts or courtyards

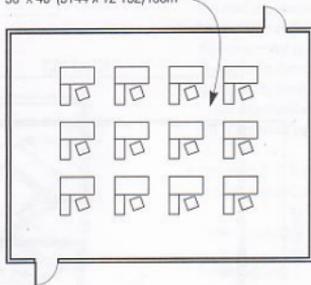
Exercise rooms	50 gross
H-5 Fabrication and manufacturing areas	200 gross
Industrial areas	100 gross
Institutional areas	
Inpatient treatment areas	240 gross
Outpatient treatment areas	100 gross
Sleeping areas	120 gross
Kitchens, commercial	200 gross
Library	
Reading rooms	50 net
Stack area	100 gross
Locker rooms	50 gross
Mercantile	
Basement and grade floor areas	30 gross
Areas on other floors	60 gross
Storage, stock, shipping areas	300 gross
Residential	200 gross
Skating rinks, swimming pools	
Rink and pool	50 gross
Decks	15 gross
Stages and platforms	15 net
Accessory storage areas, mechanical equipment room	300 gross
Warehouses	500 gross

¹For SI: 1 square foot = 0.0929 m²

Business areas	100 gross
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Occupant load =
 $30' \times 40' = 1200'$
 $1200 / 100 = 12$

- 30' x 40' (9144 x 12 192) room



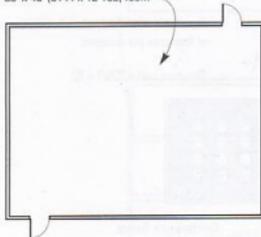
- Business area
- From Table 1003.2.2.2, allow 100 sf (9.29 m²) of floor area per occupant.

Occupant load = $1200/100 = 12$

Assembly without fixed seats Concentrated (chairs only— not fixed) <u>Auditoriums, churches and chapels, dance floors, lobbies accessory to assembly occupancy, lodge rooms, reviewing stands, stadiums, waiting area</u>	7 net
Standing space Unconcentrated (tables and chairs) <u>Conference rooms, dining rooms, drinking establishments, gymnasiums, lounges, and stages</u>	5 net 15 net

Occupant load =
 $30' \times 40' = 1200'$
 $1200 / 5 = 240$

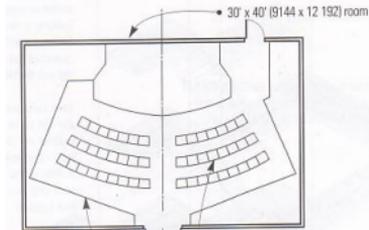
- 30' x 40' (9144 x 12 192) room



- Standing assembly area
- From Table 1003.2.2.2, allow 5 sf (0.46 m²) of floor area per occupant.

Assembly with fixed seats	See 1003.2.2.9
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**Occupant load =
Number of fixed
seats**

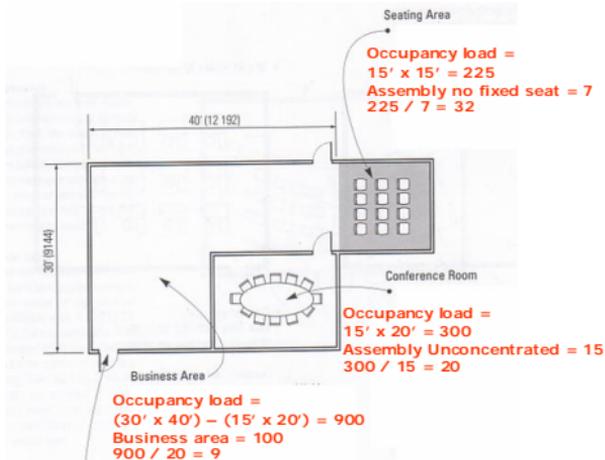


1003.2.2.9 Fixed seating. For areas having fixed seats and aisles, the occupant load shall be determined by the number of fixed seats installed therein.

For areas having fixed seating without dividing arms, the occupant load shall not be less than the number of seats based on one person for each 18 inches (457 mm) of seating length.

The occupant load of seating booths shall be based on one person for each 24 inches (610 mm) of booth seat length measured at the backrest of the seating booth.

- Fixed seating for 48 occupants
- No standing room, fixed walls
- Occupant load = 48
- This example is based upon § 1003.2.2.9 as referenced in Table 1003.2.2.2.



Total design occupancy load = 32 + 20 + 9 = 61

2. Calculating number of exits and exit access

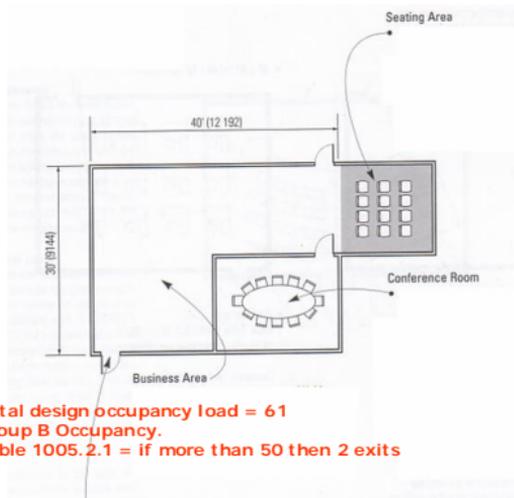
Assembly (A)
 Business (B)
 Educational (E)
 Factory & Industrial (F)
 High Hazard (H)
 Institutional (I)
 Mercantile (M)
 Residential (R)
 Storage (S)
 Utility & Misc. (U)

International Building Code
 Table 1005.2.1

Occupancy	Per Table 1005.2.1				Per Section 1004.2.5	
	Maximum Occupant Load w/ 1 Exit	Minimum No. of Occupants with 2 Exits	No. of Occupants Requiring 3 Exits	No. of Occupants Requiring 4 Exits	Length of Common Path-of-Egress Travel** before 2 Paths of Egress Travel are Required	
		Up to 500	501-1,000	> 1,000	Nonsprinklered	Sprinklered
All	-					
A, E	50	51-500	-	-	75 (22 850)	75
B, F	50	51-500	-	-	75*	100
H-1, 2, 3	3	4-500	-	-	25 (7620)	25
H-4, 5	10	11-500	-	-	75	75
I-1	10	11-500	-	-	75	75
I-2	Per § 1004.2.3.2	1-500	-	-	75	75
I-3	10	11-500	-	-	100 (30 480)	100
I-4	10	11-500	-	-	75	75
M	50	51-500	-	-	75	75
R	10	11-500	-	-	75	75
S	30	31-500	-	-	75*	100
U	50	51-500	-	-	75*	75*

* Tenant spaces with an occupant load of less than 30 may have a common path-of-egress travel up to 100 feet (30 480).

**See illustration on page 167.

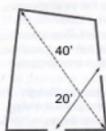


3. Calculating the location of exit access

Exits and Exit-Access Doorway

Arrangement

§ 1004.2.2 requires that all exits be obvious to the occupants and be arranged for ease of use in a rational manner.

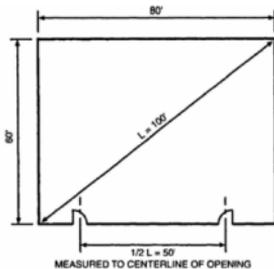


When two exits are required, they are to be placed a distance apart equal to one-half the diagonal dimension of the space. The code does not specify where the dimensions are to be taken, but the most prudent measurement is to the centerline of the doorway.



In sprinklered buildings, the exits may be more closely spaced. Exit doors or exit-access doorways may be a minimum of one-third the diagonal dimension of the area served.

When three exits are required, two are to be placed as noted above and the third is to be arranged a reasonable distance apart so that if one becomes blocked, the other two will be available. Determination of the location of the third exit is thus open to interpretation by the building official.



EXAMPLE: Office, B Occupancy

Occupant Load Factor Per Table 10-A: 100 sf per occupant

Area: $60' \times 80' = 4,800$ sf

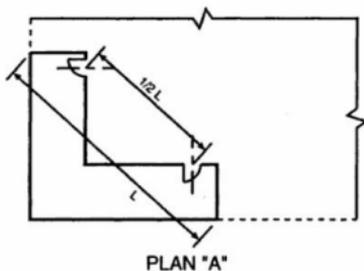
Number of Occupants: $4,800/100 = 48$ occupants; greater than 30, therefore two exits are required

Separated by $1/2$ the length of the diagonal distance (L)

$L = 100' ; L/2 = 50'$

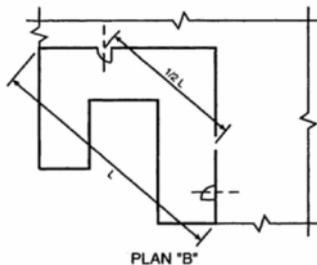
REFERENCE: SECTION 1004.2.4

FIGURE 7-19 MEASUREMENT OF DIAGONAL DISTANCES



PLAN "A"

Shown is a common corner configuration for a building's partial floor. In all these examples only a portion of a **building** is shown. The concept remains the same whether for a portion of a floor or the entire floor. The exits have to be separated by not less than the length of one-half the diagonal distance measured across the longest diagonal of the area served.

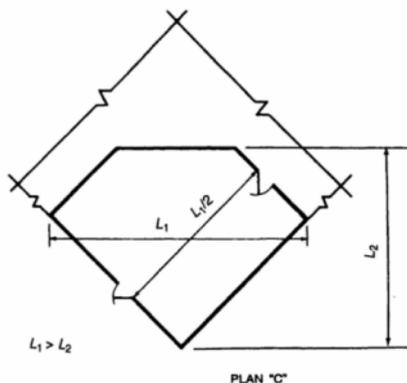


PLAN "B"

The shape of the area for which the separation of exits is to be determined can wrap around space outside of the area under consideration. The length of the longest diagonal may extend through the outside space. Thus, the measurement is unchanged by the configuration or the presence of outside space. The method remains the same, i.e., the longest diagonal is used.

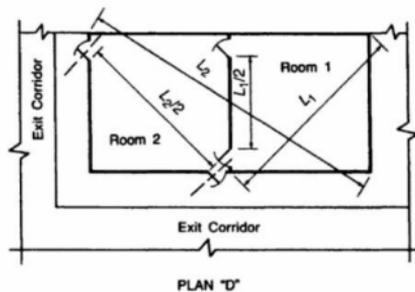
REFERENCE: SECTION 1004.2.4

FIGURE 7-20 MEASUREMENT OF DIAGONAL DISTANCES WITHIN IRREGULARLY SHAPED SPACES



PLAN "C"

When the area served is irregular in shape with more than four sides, the longest diagonal must be used to determine the required separation of exits. Assuming $L_1 > L_2$ then $L_1/2$ which will set the minimum exit separation.

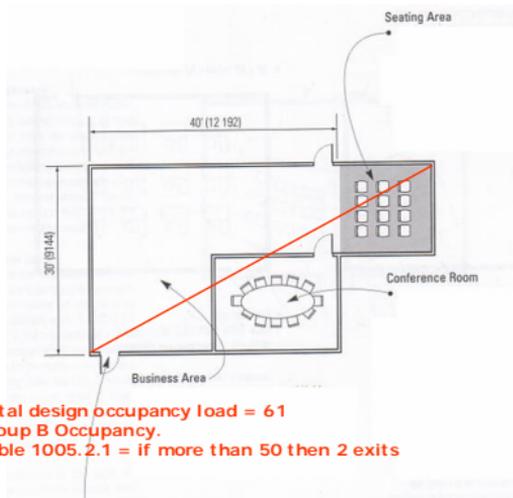


PLAN "D":

Room 1 exits into Room 2. In Room 1 the separation of exits uses as its longest diagonal that of the room being served. The Room 2 measurement of the separation of exits has to include Room 1 as it is part of the total area served.

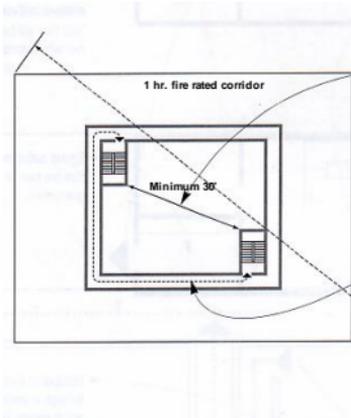
For example, in a suite of offices the longest diagonal will be that which crosses the entire suite, not just that of the least area leading to a corridor. The space should be measured to include the entire area of the suite and the exits then arranged accordingly.

REFERENCE: SECTION 1004.2.4



4. Egress: corridors & travel

**EXCEPTIONS FOR CORRIDOR & SPRINKLERED BUILDINGS:
1 HR. FIRE RATED CORRIDORS**

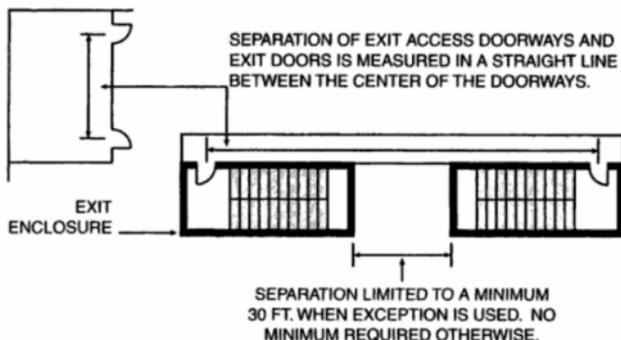


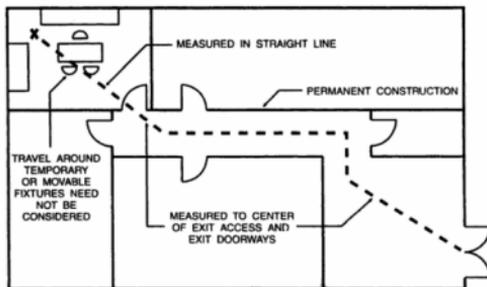
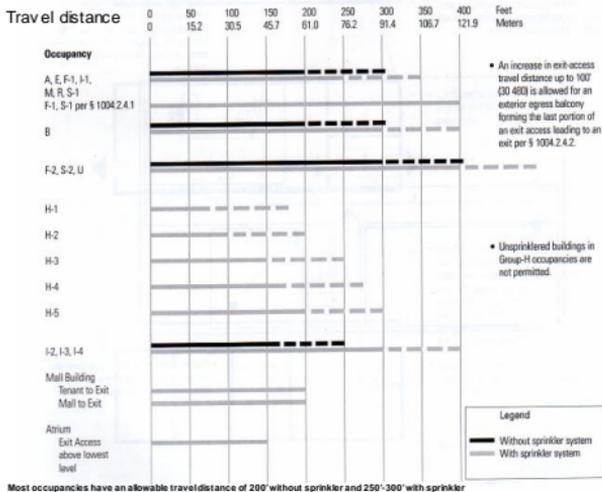
- There are exceptions to the exit layout for corridors and for sprinklered buildings.

- When a 1-hour fire-rated corridor is provided, the exit separation may be measured along a direct path of travel within the corridor. In this case, the exit enclosures accessed by the corridor must be a minimum of 30' (9144) apart in a direct line measurement. This provision addresses the required separation of exit enclosures, such as for stairs, in the core of office buildings.

- In such instances, the corridor connecting the tenant spaces to the exit enclosures allows placement of the exit enclosures closer together than half the diagonal distance of the floor without a corridor. However, the required separation of exit enclosures precludes the use of contiguous exit enclosures. The enclosure edges must be at least 30' (9144) apart.

...in other words





Travel distance is to be measured in a straight line along the accessible path. The path need not take into account movable objects or fixtures such as desks or tables. The path must include distances around permanent construction such as walls or fixed partitions.

Basic travel distances are 200 feet in non-sprinklered buildings and 250 feet in sprinklered buildings.

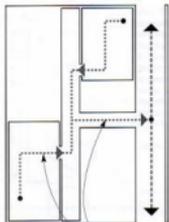
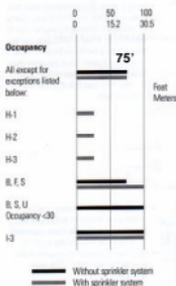
The 100 foot corridor increase is allowable even in unrated corridors construction in accordance with the exceptions to Section 1004.3.4.3

REFERENCE: SECTION 1004.2.5

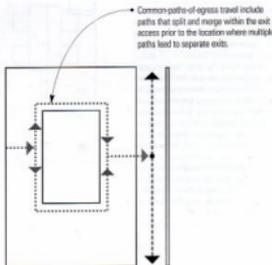
FIGURE 7-24 EXIT TRAVEL ILLUSTRATED

Common-Path-of-Egress Travel

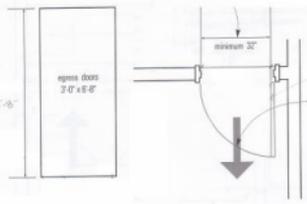
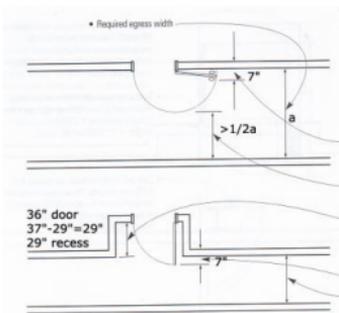
§ 1002 defines a common-path-of-egress travel as that portion of an exit access that occupants are required to traverse before two separate and distinct paths of egress travel to two exits are available. As noted earlier in the table on page 150, common-path-of-egress travel are limited.

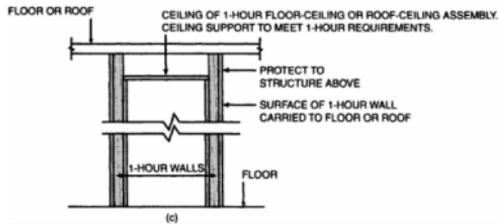
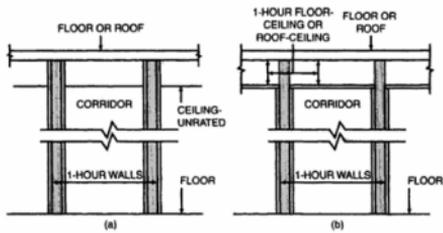


A common-path-of-egress travel is any portion of an exit access offering an occupant no choice between separate and distinct paths of egress travel to two exits. It is measured from the most remote point in a room to that point where multiple paths to separate exits are available to occupants.



Common-path-of-egress travel include paths that split and merge within the exit access prior to the location where multiple paths lead to separate exits.





5. Exit stairs & ramps

Smoke-proof Enclosures

§ 1005.2.5 requires smoke-proof enclosures or pressurized stairways for each of the required exits in high-rise buildings (4, 403), where floor surfaces are more than 75 (22 803) above the lowest level of fire-department vehicle access, and in underground buildings (4, 402), where floor surfaces are more than 33 below the level of exit discharge.

The stairway enclosures are to comply with the requirements of § 1003.20 for fire-protection systems in smoke-proof enclosures.

- The stairways shall exit into a public way or an exit passageway, yard or open space having direct access to a public way.
- The exit passageway shall have no other openings, which implies it is not used for any other purposes except for egress, and shall be of 2-hour fire-resistance rated construction.
- Exceptions allow other openings into the exit passageway when it is pressurized and provided as for the smoke-proof enclosure or the pressurized stairway.
- There are no limits on travel distance in vertical exit and exit-passageway enclosures so they could be many stories high or very long in horizontal distance. The intent is that occupants have the protection necessary to give them time in an emergency to safely traverse the egress travel distance.



Exit Passageways

§ 1005.3.1 contains the requirements for exit passageways, which are similar to corridors in this exit access, but have more restrictions placed upon their use. They are similar to vertical stairway enclosures but are used for the horizontal portions of exits.

- Width requirements for exit passageways are similar to other parts of the egress route, with a 44" (1118) minimum width for typical exit passageways and 36" (914) for those serving 50 or fewer occupants.
- Doors may not project more than 7" (178) into the passageway when fully open, nor reduce the required width by more than one-half in their fully open position.
- Exit passageways are to be of at least 1-hour fire-rated construction, or more if connected to an exit enclosure with a

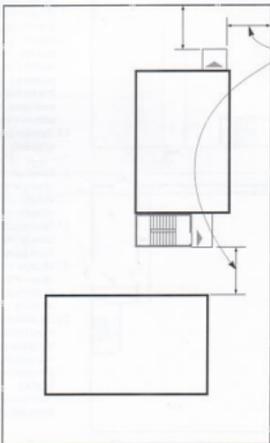
EXIT DISCHARGE

Exit-Discharge Capacity

§ 1006.2.1 requires that the capacity of an exit discharge be not less than the required discharge capacity of the exits being served.

Exit-Discharge Components

Exit-discharge components are presumed to be outside the building envelope and sufficiently open to prevent the accumulation of smoke or toxic gases.



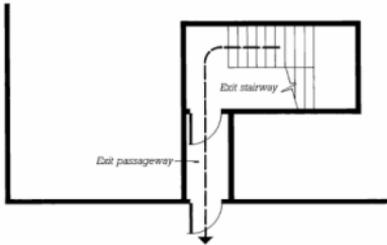
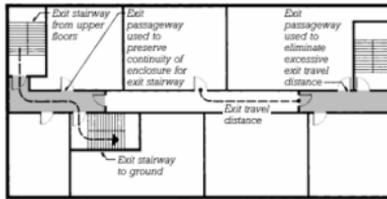
Exit-Discharge Location

- § 1006.2.2 requires that exit-discharge components be separated from adjacent property lines by at least 10' (3048) of space, or from other buildings on the same lot under the adjacent elements are fire-rated per § 704, based on fire-separation distance.

EXIT PASSAGeways

An exit passageway is a horizontal means of exit travel that is protected from fire in the same manner as an enclosed exit stair. An exit passageway has several uses: It may be used to preserve the continuity of enclosure for an exit stair whose location shifts laterally as it descends through the building. It may be used to eliminate excessive travel distance to an exit. And it may be used as part of an exit discharge to connect an enclosed stair to an exterior door.

The widths of passages, doors, landings, and stairs used as exits must be determined in accordance with values given by the model codes, as shown on pages 283–287 and 289–293. For detailed design requirements concerning illumination, emergency illumination, marking, finish materials, and hardware of exits, consult the appropriate building code.



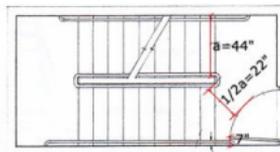
EXIT DISCHARGE THROUGH AN EXIT PASSAGeway

Stairways

§ 1003.3 covers requirements for the design of stairs and stairways.

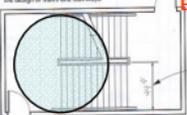


• § 1003.3.3.1. Stairways must be at least 44" (1118) wide, except when serving an occupant load of less than 50, they may be 38" (964) wide.



Stairways

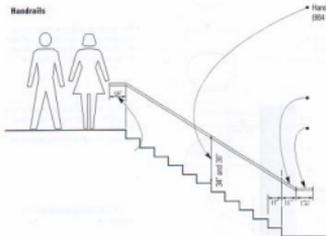
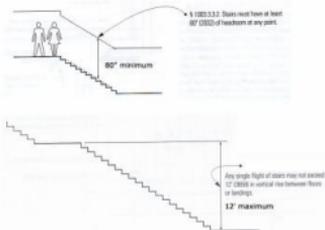
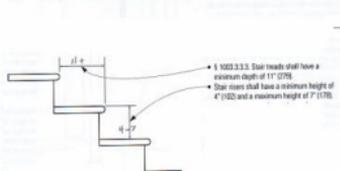
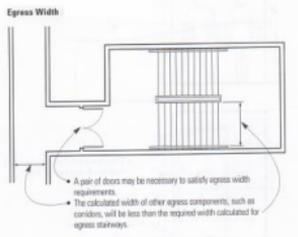
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• § 1003.3.1. Stairways must be at least 44" (1118) wide, except when serving an occupant load of less than 50, they may be 38" (964) wide.



• § 1003.3.3.3. Stair treads shall have a



Ramps

