



State of Connecticut
Department of Administrative Services
Division of Construction Services
Office of Education and Data Management

*Office of Education and Data Management
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Means of Egress Doors and Special Locking Arrangements

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Overview

This presentation will provide an overview of the requirements for the design, construction and installation of doors, hardware, locks and locking systems used as part of the means of egress in buildings. Topics will include door operations, delayed egress, access-controlled electromagnetic locks, stairway doors, panic and fire exit hardware.



Egress Doors & Locking Arrangements

Agenda

- New & existing doors
- Hardware
- Accessibility
- Fire doors
- ITM

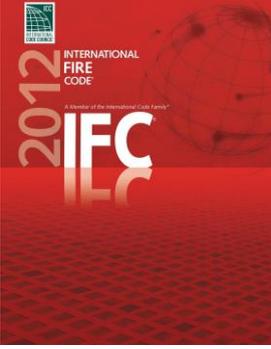


Egress Doors & Locking Arrangements

Regulatory Documents



Effective October 1, 2016



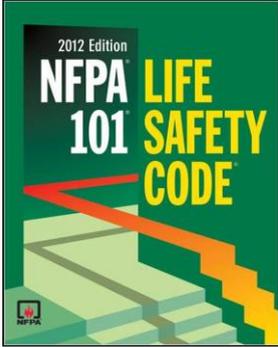
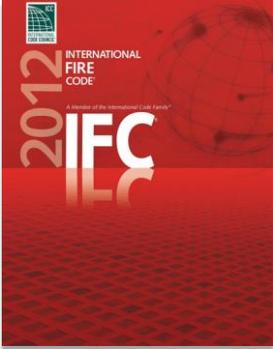


Egress Doors & Locking Arrangements

Regulatory Documents



Effective October 1, 2016





Egress Doors & Locking Arrangements

Basics

Means of egress doors shall meet the requirements of this section. Doors serving a *means of egress* system shall meet the requirements of this section and Section 1020.2.

Doors provided for egress purposes in numbers greater than required by this code shall meet the requirements of this section.



Egress Doors & Locking Arrangements

Basics



- Swing
- Size
- Opening forces
- Latching
- Locking



Egress Doors & Locking Arrangements

Basics

Means of egress doors shall be readily distinguishable from the adjacent construction and finishes such that the doors are easily recognizable as doors.

Mirrors or similar reflecting materials shall not be used on means of egress doors.

Means of egress doors shall not be concealed by curtains, drapes, decorations or similar materials.



Egress Doors & Locking Arrangements

Hidden/Secret



Egress Doors & Locking Arrangements

Impediments



The photograph shows a retail clothing store. In the foreground, several racks of jackets in various colors (red, blue, grey) are visible. In the background, a doorway is marked with a red 'EXIT' sign. The store is brightly lit with track lighting on the ceiling.

 Egress Doors & Locking Arrangements

Impediments



The photograph shows a room with a large window covered by white louvered shutters. An 'EXIT' sign is mounted above the window. The room has a blue carpet and a patterned rug. The lighting is dim, suggesting it might be nighttime.

 Egress Doors & Locking Arrangements

Impediments



 Egress Doors & Locking Arrangements

Impediments



 Egress Doors & Locking Arrangements

Impediments



The image shows a red double door with glass panels. The glass panels are partially obscured by a silver mesh screen and decorative elements, including a star and floral patterns. A sign above the door reads "EMERGENCY EXIT ONLY".



Egress Doors & Locking Arrangements

Reliability



The image shows a blue door with a red "EXIT" sign above it. Two wooden bars are placed horizontally across the door, one near the top and one near the bottom, which would prevent the door from being opened.



The image shows a close-up of a hand using a key to unlock a door handle. The key is inserted into the lock mechanism, and the handle is being turned.



Egress Doors & Locking Arrangements

Recognizable



Egress Doors & Locking Arrangements

Recognizable



Egress Doors & Locking Arrangements

Mirrors



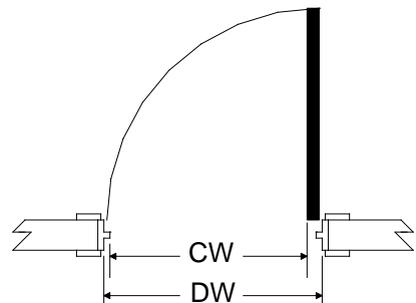
Egress Doors & Locking Arrangements

Door Leaf Width - maximum



Egress Doors & Locking Arrangements

Door Width - minimum

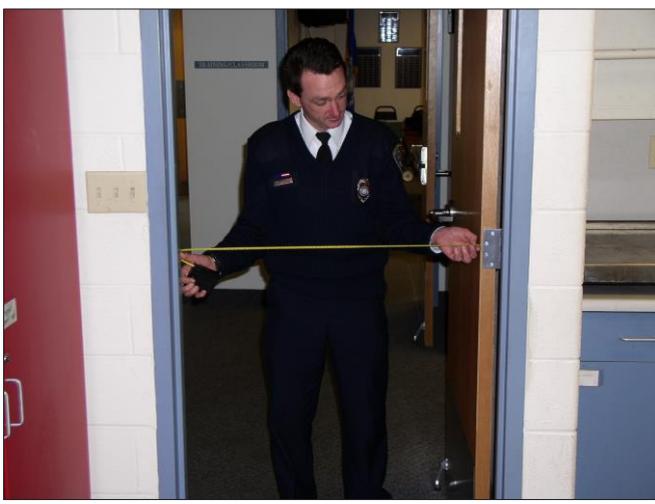


- New ≥ 32 " CW
- Existing ≥ 28 " DW
- Lesser permitted
- Wider required



Egress Doors & Locking Arrangements

Door Width - measurement



Egress Doors & Locking Arrangements

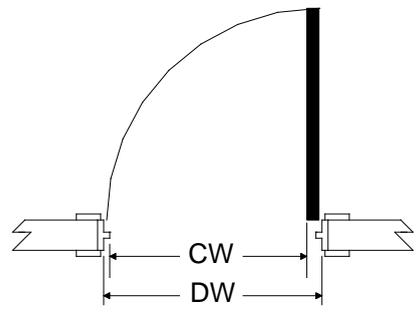
Door Width - minimum



Egress Doors & Locking Arrangements

Door Width - minimum

of Persons using door x 0.2" per person



Egress Doors & Locking Arrangements

Door Width

**Pair –
single
opening**



Egress Doors & Locking Arrangements

Door Width

**Pair –
multiple
openings**



Egress Doors & Locking Arrangements

Door Width

Pair –
multiple
openings



Egress Doors & Locking Arrangements

Wider Doors

I-2
Healthcare
 $\geq 41 \frac{1}{2}$ "



Egress Doors & Locking Arrangements

Narrower Doors

**I-3
Detention**

≥ 28"



 Egress Doors & Locking Arrangements

Narrower Doors

Storage closets
≤ 10 sq. ft.

No minimum



 Egress Doors & Locking Arrangements

Narrower Doors

Interior doors in units
not required to be
accessible

Other than R-1

$\geq 31 \frac{3}{4}$ "



B & B
 ≥ 28 "
 ≥ 24 " *bathrooms*



Egress Doors & Locking Arrangements

Means of Egress v. Escape



Egress Doors & Locking Arrangements

Projections

The first diagram, labeled Figure 1008.1.1(1), shows a side view of a door opening. It indicates a 'DOOR OPENING CLEAR WIDTH' and a '32" BETWEEN FACE OF DOOR AND THE STOP (80" HIGH)'. Labels include 'WALL', 'DOOR FRAM', and 'DOOR'. The second diagram, labeled FIGURE A.7.2.1.2.1(a), shows a top-down view of a door opening. It indicates a 'Minimum clear width' and a '90 degrees (new only)' angle. Labels include 'Wall', 'Door width', and 'Door'.

Figure 1008.1.1(1)
TYPICAL DOOR OPENING CLEARANCE

FIGURE A.7.2.1.2.1(a) Minimum Clear Width.

Egress Doors & Locking Arrangements

Projections

The diagram shows a side view of a door opening with a 'DOOR OPENINGS CLEAR WIDTH - 32/815'. A callout bubble indicates 'ALLOW PASSAGE FOR CYLINDER OF 32 IN. DIAMETER AND 78 IN. HEIGHT'. Labels include 'WALL', 'DOOR FRAME', and 'DOOR'. The door is shown with a red hatched pattern.

FIGURE C404.2.2(a)
TYPICAL DOOR OPENING CLEARANCE

Egress Doors & Locking Arrangements

Projections

Figure 1008.1.1(2)
TYPICAL DOOR OPENING CLEARANCE WITH PANIC HARDWARE



Egress Doors & Locking Arrangements

Projections

FIGURE A.7.2.1.2.1(b) Minimum Clear Width with Permitted Obstructions.

FIGURE A.7.2.1.2.2(b) Door Width — Egress Capacity with Permitted Obstructions.



Egress Doors & Locking Arrangements

Headroom

- 80" new
- 78" w/in residential
- 76" exterior residential
(non-exit)
- 72" existing w/ padding



Egress Doors & Locking Arrangements

Door Swing Direction



Direction of egress travel

- ≥ 50 people
- Exit stair enclosure – other than living units
- High hazard
- Horizontal exit



Egress Doors & Locking Arrangements

Door Leaf Encroachment

The diagram illustrates the clearance requirements for a door leaf encroachment. It shows a top-down view of a door opening with a door leaf swinging into the room. Key dimensions are labeled: 'X' represents the minimum required width of the door opening; $\frac{1}{2}(X)$ is the distance from the door edge to the start of the encroachment; (X-7 in.) is the clearance from the door edge to the end of the encroachment; and (X-7 in.) is the clearance from the end of the encroachment to the door edge. A note states: "X" = minimum required width.

VO Egress Doors & Locking Arrangements

Door Leaf Encroachment

The diagram shows a side view of a door leaf encroaching into a room. A label indicates that the encroachment must be $\frac{1}{2}$ required width. Another label indicates a maximum height of 7" Max for the encroachment. The door leaf is shown with vertical slats.

VO Egress Doors & Locking Arrangements

Opening Forces



- Release latch < 15 lbs
- Set door in motion < 30 lbs
- Fully open door < 15 lbs
(< 50 lbs for existing doors)
- Breakaway door < 50 lbs



Egress Doors & Locking Arrangements

Opening Forces

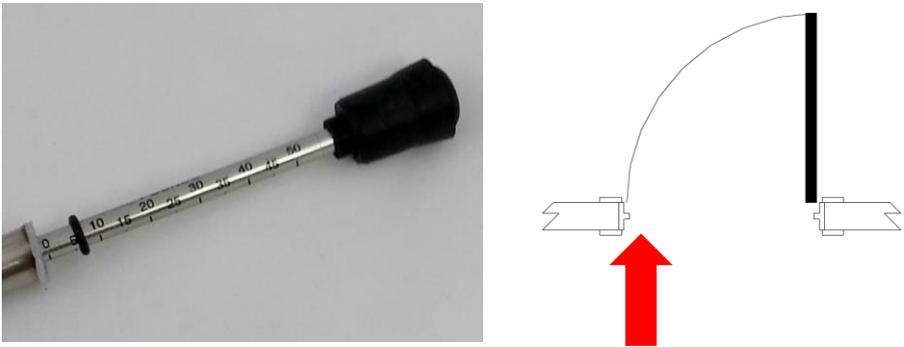


- Interior swinging
- Non-fire doors
- ≤ 5 lbs



Egress Doors & Locking Arrangements

Opening Forces



The image shows a door opening force gauge, which is a device used to measure the force required to operate a door handle. It consists of a black handle and a metal shaft with a scale ranging from 0 to 50. To the right is a schematic diagram of a door handle assembly. A red arrow points upwards from the handle, indicating the direction of the force applied during the opening test.



Egress Doors & Locking Arrangements

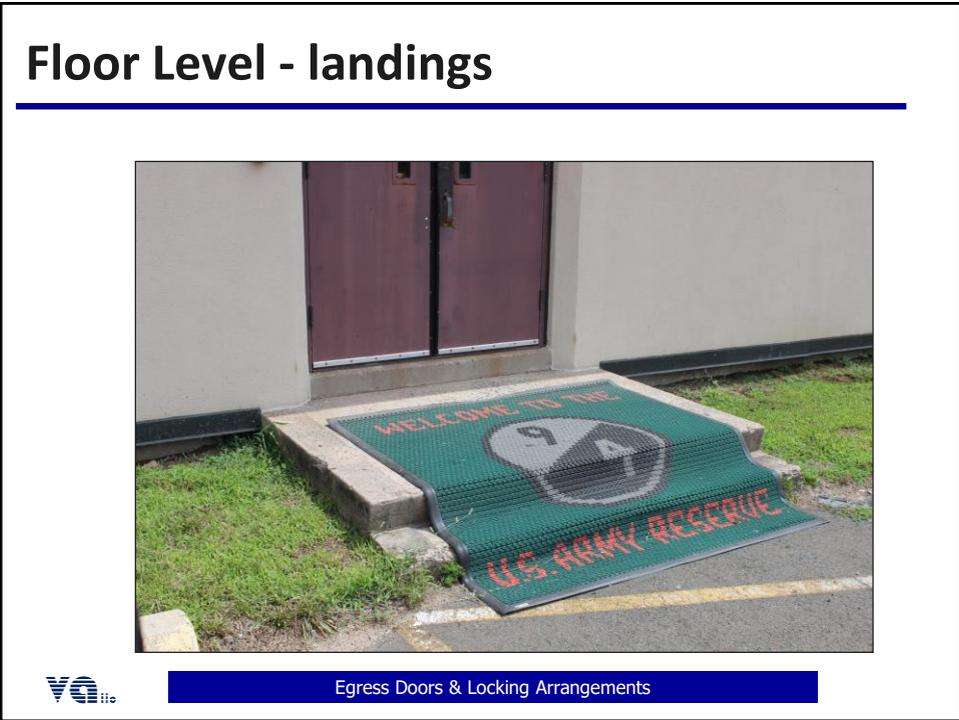
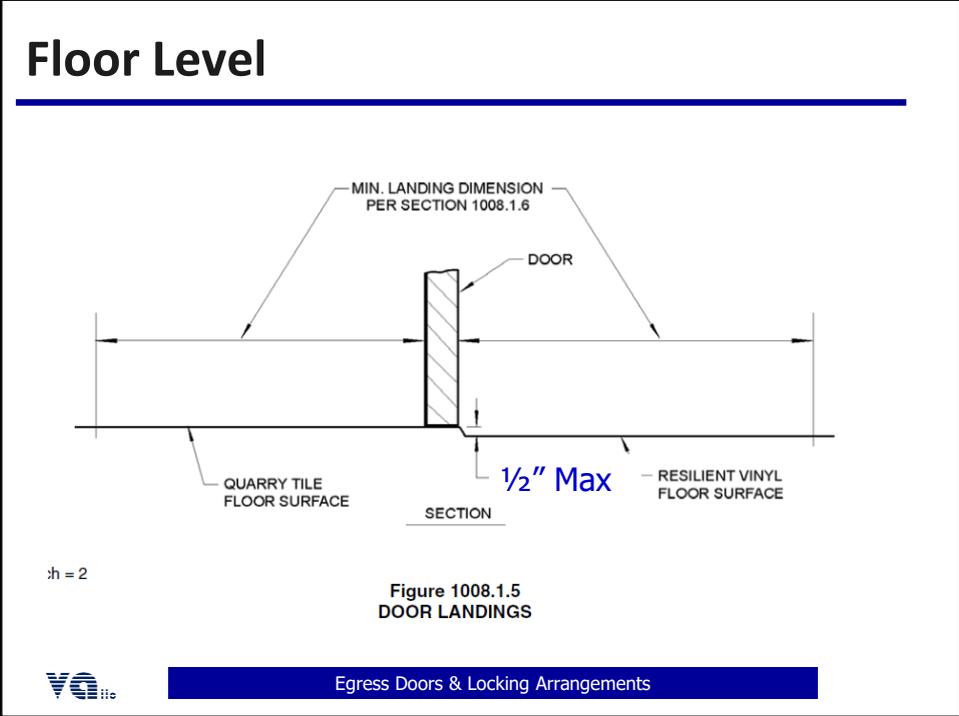
Opening Forces



The image shows a large, heavy-duty vault door, likely made of steel, with a circular opening. The door is partially open, revealing a metal grate and a metal cart inside. A date stamp '08.25.2008 11:53' is overlaid on the bottom right of the image.



Egress Doors & Locking Arrangements



Floor Level - landings

- Existing
- OL < 50
- Top of stair only
- Direction of travel



Egress Doors & Locking Arrangements

Thresholds

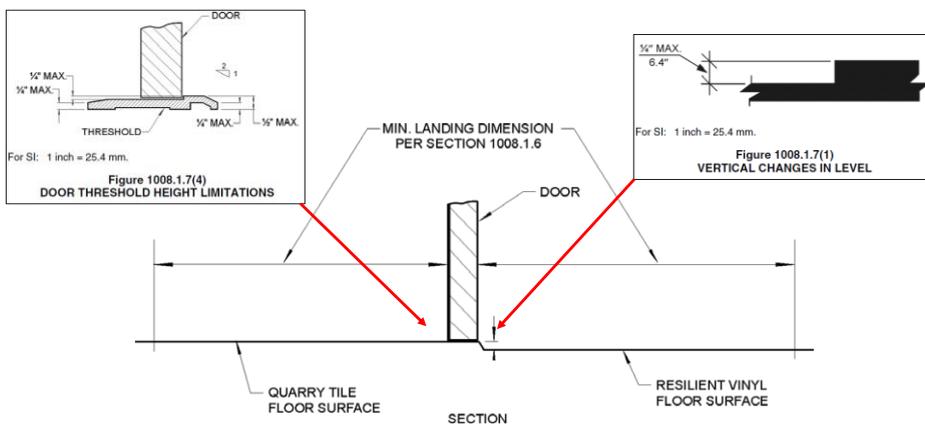
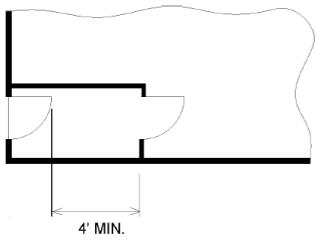


Figure 1008.1.5
DOOR LANDINGS



Egress Doors & Locking Arrangements

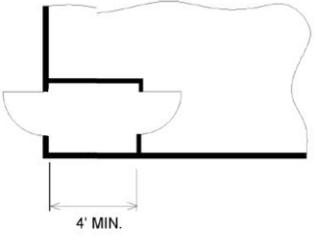
Doors in Series



4' MIN.

For SI: 1 foot = 304.8 mm.

Figure 1008.1.8(1)
SPACING OF DOORS IN SERIES



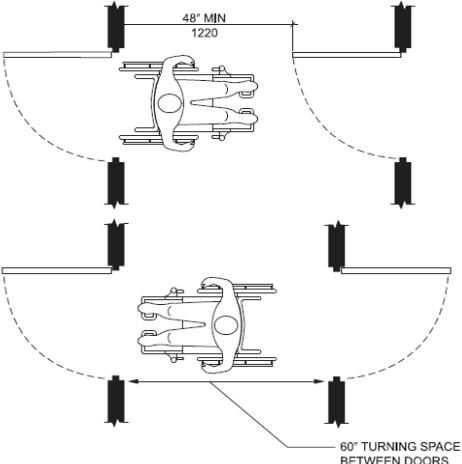
4' MIN.

Figure 1008.1.8(1)
SPACING OF DOORS IN SERIES



Egress Doors & Locking Arrangements

Doors in Series



48" MIN
1220

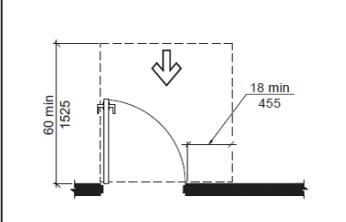
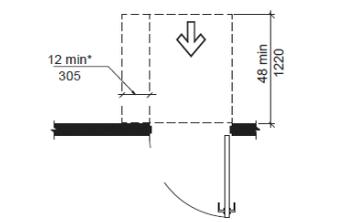
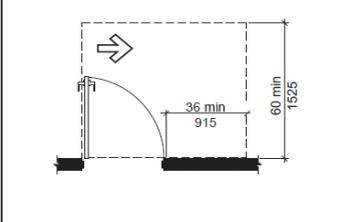
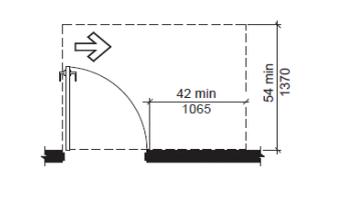
60° TURNING SPACE
BETWEEN DOORS

FIGURE C404.2.5(a)
DOORS IN A SERIES—STRAIGHT



Egress Doors & Locking Arrangements

Maneuvering Clearances

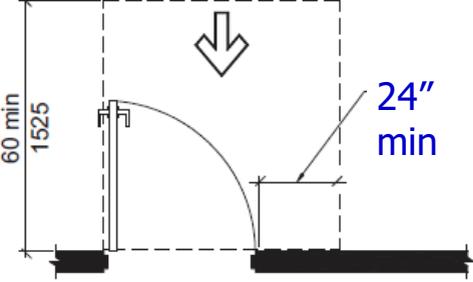
 <p>(a) Front Approach, Pull Side</p>	 <p>*If both closer and latch are provided (b) Front Approach, Push Side</p>
 <p>(c) Hinge Approach, Pull Side</p>	 <p>(d) Hinge Approach, Push Side</p>



Egress Doors & Locking Arrangements

Maneuvering Clearances





(a) Front Approach, Pull Side



Egress Doors & Locking Arrangements

Door Surface



FIGURE C404.2.9(a)
DOOR SURFACE OBSTRUCTION



Egress Doors & Locking Arrangements

Doors in Series



Egress Doors & Locking Arrangements

Doors in Series

Man-Trap



Egress Doors & Locking Arrangements

Door Locking



- Doors readily opened from egress side when space occupied
- Locks not require key, tool, special knowledge or effort



Egress Doors & Locking Arrangements

Obvious Method of Release



The first photograph shows a silver metal push bar mounted on a wooden door. A small blue sign with the word "PUSH" in white capital letters is attached to the bar. The second photograph shows a silver metal lever handle mounted on a dark wood door with a glass insert.

 Egress Doors & Locking Arrangements

Obvious Method of Release



The first photograph shows a person's hand holding an orange card up to a black card reader mounted on a door. The person is wearing a blue shirt and a black watch. The second photograph shows a silver metal keypad lock with a lever handle, mounted on a door.

 Egress Doors & Locking Arrangements

Tight Grasping

...tight grasping, pinching, or twisting
of the wrist



Egress Doors & Locking Arrangements

Key-Operated

A ($OL \leq 300$), B, F, M, S, & religious worship



Egress Doors & Locking Arrangements

Releasing Operations

Inside Residential units & existing conditions ($OL \leq 3$)



Egress Doors & Locking Arrangements

Panic/Fire Exit Hardware



A & E w/ $OL \geq 50$

A, E, & DC $OL \geq 100$

Group H

UL 305 *panic*

UL 305 & UL 10C –
fire exit hardware



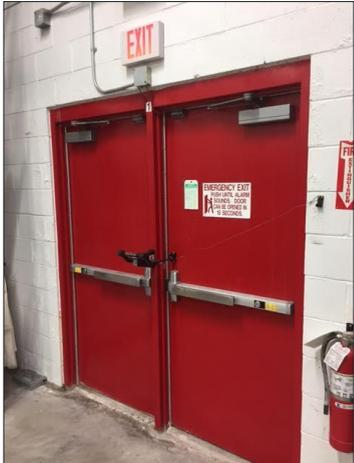
Egress Doors & Locking Arrangements

Panic/Fire Exit Hardware



Egress Doors & Locking Arrangements

Panic/Fire Exit Hardware



Egress Doors & Locking Arrangements

Fire Exit Hardware

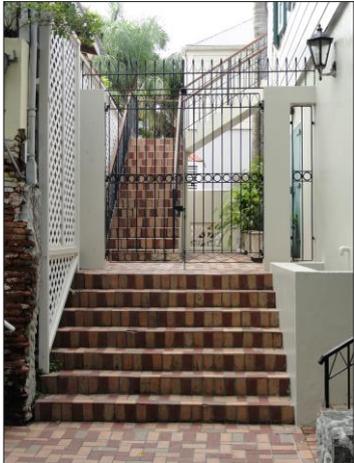


Fusible Alignment Pin



Egress Doors & Locking Arrangements

Panic/Fire Exit Hardware



Egress Doors & Locking Arrangements

Delayed Egress

Prohibited in A, E, & H



Egress Doors & Locking Arrangements

Alarmed Egress



Egress Doors & Locking Arrangements

Access Controlled

A, B, E, I-2, M, R-1, & R-2



Egress Doors & Locking Arrangements

Electromagnetically locked

A, B, E, I-2, M, R-1, & R-2



Egress Doors & Locking Arrangements

Patient Room Doors



- Locks prohibited, unless
 - Corridor side
 - Staff has keys
 - Occupant can egress



Egress Doors & Locking Arrangements

Correctional Facilities



New

- Manual means
- And one other method
 - Remote unlocking
 - Sprinklers
 - Manual alarm box



Egress Doors & Locking Arrangements

Clinical or Security Needs

I-1 & I-2

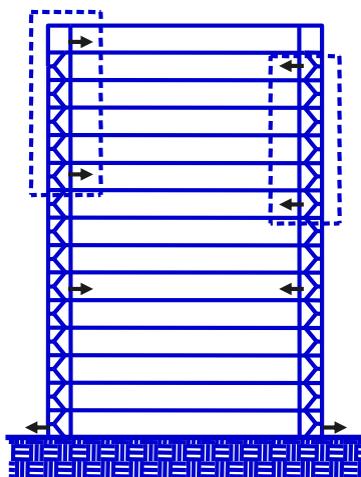


- Remote unlocking
- Smoke detection
- Sprinklers
- Fail-safe electric locks
- Staff carry keys, codes, etc.
- Emergency plan



Egress Doors & Locking Arrangements

Stairwell Re-entry



Egress Doors & Locking Arrangements

Door Swing Alternatives

B, F, M, & S





Egress Doors & Locking Arrangements

Door Swing Alternatives

Horizontal Sliding Door





Egress Doors & Locking Arrangements

Door Swing Alternatives

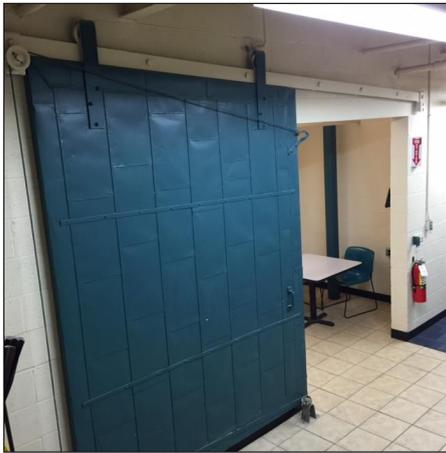
Manual sliding



Egress Doors & Locking Arrangements

Door Swing Alternatives

Manual sliding



Egress Doors & Locking Arrangements

Door Swing Alternatives

Revolving Door



Egress Doors & Locking Arrangements

Door Swing Alternatives

Revolving Door



Egress Doors & Locking Arrangements

Door Swing Alternatives

Healthcare



Egress Doors & Locking Arrangements

Door Swing Alternatives

Powered Doors



Egress Doors & Locking Arrangements

Door Swing Alternatives

Turnstiles



Egress Doors & Locking Arrangements

Door Swing Alternatives

Turnstiles ?



Egress Doors & Locking Arrangements

Opening Protection

TABLE 716.5
OPENING FIRE PROTECTION ASSEMBLIES, RATINGS AND MARKINGS

TYPE OF ASSEMBLY	REQUIRED WALL ASSEMBLY RATING (hours)	MINIMUM FIRE DOOR AND FIRE SHUTTER ASSEMBLY RATING (hours)	DOOR VISION PANEL SIZE	FIRE RATED GLAZING MARKING DOOR VISION PANEL*	MINIMUM SIDELIGHT/TRANSOM ASSEMBLY RATING (hours)		FIRE-RATED GLAZING MARKING SIDELITE/TRANSOM PANEL	
					Fire protection	Fire resistance	Fire protection	Fire resistance
Fire walls and fire barriers having a required fire-resistance rating greater than 1 hour	4	3	Not Permitted	Not Permitted	Not Permitted	4	Not Permitted	W-240
	3	3 ^a	Not Permitted	Not Permitted	Not Permitted	3	Not Permitted	W-180
	2	1½	100 sq. in. ^c	≤100 sq.in. = D-H-90 >100 sq.in.= D-H-W-90	Not Permitted	2	Not Permitted	W-120
	1½	1½	100 sq. in. ^c	≤100 sq.in. = D-H-90 >100 sq.in.= D-H-W-90	Not Permitted	1½	Not Permitted	W-90
Shaft, exit enclosures and exit passageway walls	2	1½	100 sq. in. ^{c,d}	≤100 sq.in. = D-H-90 >100 sq.in.= D-H-T-or D-H-T-W-90	Not Permitted	2	Not Permitted	W-120
Fire barriers having a required fire-resistance rating of 1 hour: Enclosures for shafts, exit access stairways, exit access ramps, interior exit stairways, interior exit ramps and exit passageway walls	1	1	100 sq. in. ^{c,d}	≤100 sq.in. = D-H-60 >100 sq.in.= D-H-T-60 or D-H-T-W-60	Not Permitted	1	Not Permitted	W-60



Egress Doors & Locking Arrangements

Opening Protection

TYPE OF ASSEMBLY	REQUIRED WALL ASSEMBLY RATING (hours)	MINIMUM FIRE DOOR AND FIRE SHUTTER ASSEMBLY RATING (hours)	DOOR VISION PANEL SIZE	FIRE RATED GLAZING MARKING DOOR VISION PANEL*	MINIMUM SIDELIGHT/TRANSOM ASSEMBLY RATING (hours)		FIRE-RATED GLAZING MARKING SIDELITE/TRANSOM PANEL	
					Fire protection	Fire resistance	Fire protection	Fire resistance
Other fire barriers	1	¾	Maximum size tested	D-H-NT-45	¾			D-H-NT-45
Fire partitions: Corridor walls	1	½ ^b	Maximum size tested	D-20	¾ ^b			D-H-OH-45
	0.5	½ ^b	Maximum size tested	D-20	½			D-H-OH-20
Other fire partitions	1	¾	Maximum size tested	D-H-45	¾			D-H-45
	0.5	½	Maximum size tested	D-H-20	½			D-H-20



Egress Doors & Locking Arrangements

Opening Protection

TABLE 716.3(1)
 MARKINGS OF FIRE RATED GLAZING¹

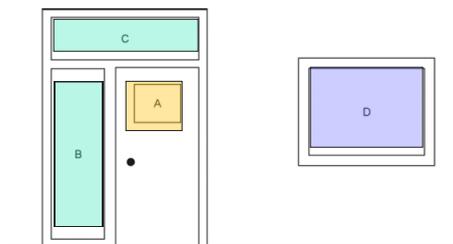
TYPE OF ASSEMBLY	REQUIRED WALL ASSEMBLY RATING (HRS)	DOOR VIEW PANEL A 100 IN ² OR LESS	DOOR VIEW PANEL A > 100 IN ²	SIDELITE OR TRANSOM PANELS B & C	WINDOW ASSEMBLY D
Fire wall and fire barrier wall	4-hr	Not Permitted	Not Permitted	W-240 ²	W-240 ²
	3-hr	Not Permitted	Not Permitted	W-180 ²	W-180 ²
	2-hr	[D-H-90]	[D-H-W-90] ³	W-120 ²	W-120 ²
	1½-hr	[D-H-90]	[D-H-W-90] ³	W-90 ²	W-90 ²
Shaft, exit enclosures and exit passageway walls	2-hr	[D-H-90]	[D-H-W-90] ³ or [D-H-T-W-90] ³	W-120 ^{2,5}	W-120 ^{2,5}
Fire barriers for enclosures of shafts, exit access stairways, exit access ramps, interior exit stairways and exit passageway walls	1-hr	[D-H-60]	[D-H-T-60] or [D-H-T-W-60] ³	W-60 ^{2,5}	W-60 ^{2,5}
Other fire barriers	1-hr	[D-H-NT-45]	[D-H-NT-45]	[D-H-NT-45]	W-60 ²
Fire barriers – incidental use areas, mixed occupancy separations	1-hr	[D-H-NT-45]	[D-H-NT-45]	[D-H-NT-45]	[OH-45] or W-60 ²
Fire partitions: Corridor walls	1-hr	[D-20]	[D-20]	[D-H-OH-45]	[OH-45] or W-60 ²
	0.5-hr	[D-20]	[D-20]	[D-H-OH-20]	[OH-20] or W-30 ²
Other fire partitions	1-hr	[D-H-45]	[D-H-45]	[D-H-45]	[OH-45] or W-60 ²
	0.5-hr	[D-H-20]	[D-H-20]	[D-H-20]	[OH-20] or W-30 ²
Smoke barriers	1-hr	[D-20]	[D-20]	[D-H-OH-45]	[OH-45] or W-60 ²
	3-hr	[D-H-90]	[D-H-W-90] ³	W-180 ²	[OH-90] or W-180 ²
Exterior walls ⁴	2-hr	[D-H-90]	[D-H-W-90] ³	W-120 ²	[OH-90] or W-120 ²
	1-hr	[D-H-45]	[D-H-45]	[D-H-45]	[OH-45] or W-60 ²

1. Markings in brackets [] are fire protection-rated glazing. Fire protection-rated glazing in doors, sidelights and transoms meets NFPA 252. Fire protection-rated glazing in windows meets NFPA 257 or UL 9.
2. Fire-resistance-rated glazing meeting ASTM E 119 or UL 263.
3. Glazing meeting both the standard for fire protection-rated glazing in fire doors (NFPA 252) and the standard fire-resistance-rated glazing (ASTM E 119 or UL 263).
4. Glazing requirements where protected openings are required by Table 705.8.
5. Only openings necessary for egress are allowed in exit access stairways and interior exit stairs.



Egress Doors & Locking Arrangements

Opening Protection



TYPE OF ASSEMBLY	REQUIRED WALL ASSEMBLY RATING (HRS)	DOOR VIEW PANEL A 100 IN ² OR LESS	DOOR VIEW PANEL A > 100 IN ²	SIDELITE OR TRANSOM PANELS B & C	WINDOW ASSEMBLY D
Fire partitions: Corridor walls	1-hr	[D-20]	[D-20]	[D-H-OH-45]	[OH-45] or W-60 ²
	0.5-hr	[D-20]	[D-20]	[D-H-OH-20]	[OH-20] or W-30 ²



Egress Doors & Locking Arrangements

Opening Protection

TABLE 716.3
 MARKING FIRE-RATED GLAZING ASSEMBLIES

FIRE TEST STANDARD	MARKING	DEFINITION OF MARKING
ASTM E 119 or UL 263	W	Meets wall assembly criteria.
NFPA 257 or UL 9	OH	Meets fire window assembly criteria including the hose stream test.
NFPA 252 or UL 10B or UL 10C	D	Meets fire door assembly criteria.
	H	Meets fire door assembly "Hose Stream" test.
	T	Meets 450°F temperature rise criteria for 30 minutes
	XXX	The time in minutes of the fire resistance or fire protection rating of the glazing assembly



Egress Doors & Locking Arrangements

Opening Protection

(Amd) Table 8.3.4.2 Minimum fire protection ratings for opening protectives in fire-resistance-rating assemblies.

Component	Walls and Partitions (hr)	Fire Door Assemblies (hr)	Fire Window Assemblies (hr)
Elevator hoistways	2	1½	NP
	1	1	NP
	2	1½	NP
Vertical shafts (including stairways, exits, and refuse chutes)	1	1	NP (3/4 in other than exits)
	½	1/3	NP (1/3 in other than exits)
	2	1½	NP
Fire barriers	1	¾	¾
Horizontal exits	2	1½	NP
Exit access corridors ¹	1	1/3	¾
Exit access corridors ¹	½	1/3	1/3
Smoke barriers ¹	½	1/3	¾



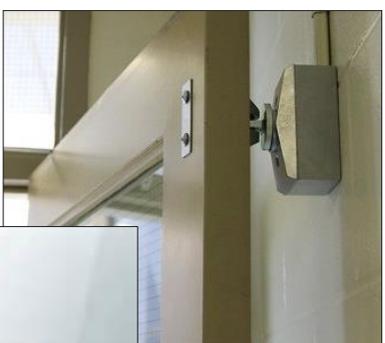
Egress Doors & Locking Arrangements

Existing Stair Doors



Egress Doors & Locking Arrangements

Fire Door Basics



Egress Doors & Locking Arrangements

Fire Door Basics



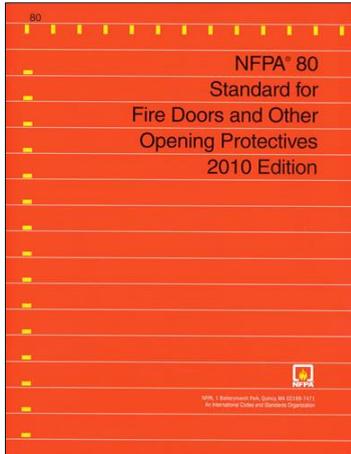
Egress Doors & Locking Arrangements

Fire Door Basics



Egress Doors & Locking Arrangements

NFPA 80



- Fabric fire safety curtains
- ITM dampers
- Door bottom clearance
- Floor fire doors
- Care & maintenance
- Glazing materials
- Fire shutters



Egress Doors & Locking Arrangements

Fire Doors

NFPA 80



- Visual & functional
- Annually
- Knowledgeable persons
- 11 specific items
- Written records
 - signed
 - kept for AHJ inspection



Egress Doors & Locking Arrangements

All Egress Doors

CFSC Part IV



- Visual & functional
- Occupancy driven
- Knowledgeable persons
- 11 specific items
 - signed
 - kept for AHJ inspection



Egress Doors & Locking Arrangements

I Got Nothing



Egress Doors & Locking Arrangements

Questions or Comments



Thank You