

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

*Office of Education and Data Management  
Spring 2017 Career Development Series*

## Means of Egress Doors and Special Locking Arrangements

Presented by  
Joseph Versteeg, Building and Fire Code  
Consultant

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**Overview**

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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

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**Agenda**

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

 Egress Doors & Locking Arrangements

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**Regulatory Documents**

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 Effective October 1, 2016

 Egress Doors & Locking Arrangements

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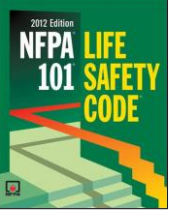
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**Regulatory Documents**

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 Effective October 1, 2016

 Egress Doors & Locking Arrangements

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**Basics**

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*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

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**Basics**

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- Swing
- Size
- Opening forces
- Latching
- Locking

 Egress Doors & Locking Arrangements

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**Basics**

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*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

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**Hidden/Secret**



Egress Doors & Locking Arrangements

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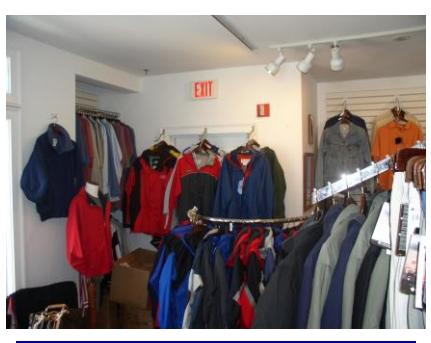
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**Impediments**



Egress Doors & Locking Arrangements

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**Impediments**



Egress Doors & Locking Arrangements

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### Impediments

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**VO**  
Egress Doors & Locking Arrangements

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### Impediments

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### Impediments

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### Reliability

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 Egress Doors & Locking Arrangements

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### Recognizable

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 Egress Doors & Locking Arrangements

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### Recognizable

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 Egress Doors & Locking Arrangements

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### Mirrors

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### Door Leaf Width - maximum

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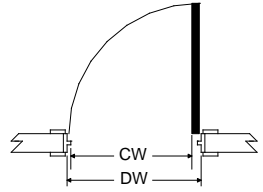
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### Door Width - minimum

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- New  $\geq 32$ " CW
- Existing  $\geq 28$ " DW
- Lesser permitted
- Wider required

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### Door Width - measurement

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YO. Egress Doors & Locking Arrangements

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### Door Width - minimum

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YO. Egress Doors & Locking Arrangements

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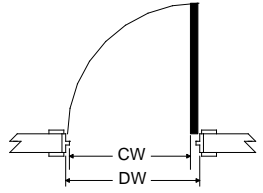
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### Door Width - minimum

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# of Persons using door x 0.2" per person



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**Door Width**

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Pair –  
single  
opening



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**Door Width**

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Pair –  
multiple  
openings



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**Door Width**

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Pair –  
multiple  
openings



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### Wider Doors

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



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### Narrower Doors

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I-3  
Detention  
 $\geq 28"$



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### Narrower Doors

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Storage closets  
 $\leq 10$  sq. ft.  
No minimum



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### Narrower Doors

Interior doors in units  
not required to be  
accessible  
Other than R-1

≥ 31 ¾"

B & B  
≥ 28"

≥ 24" *bathrooms*



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### Means of Egress v. Escape



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### Projections

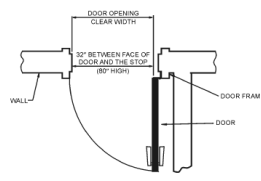


Figure 1008.1.1(f)  
TYPICAL DOOR OPENING CLEARANCE

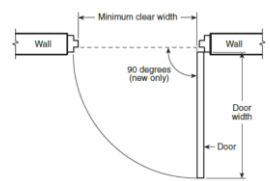


FIGURE A.7.2.1.2.1(a) Minimum Clear Width.

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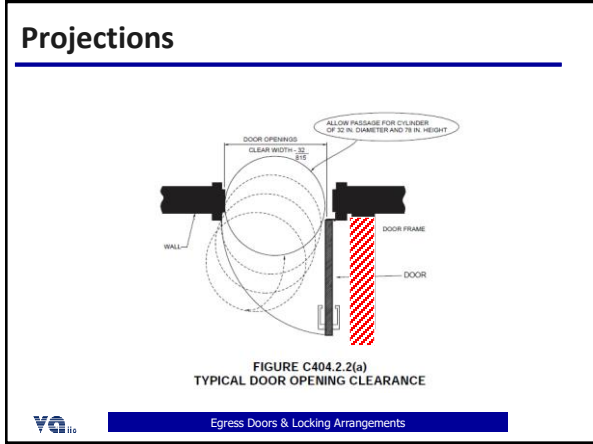
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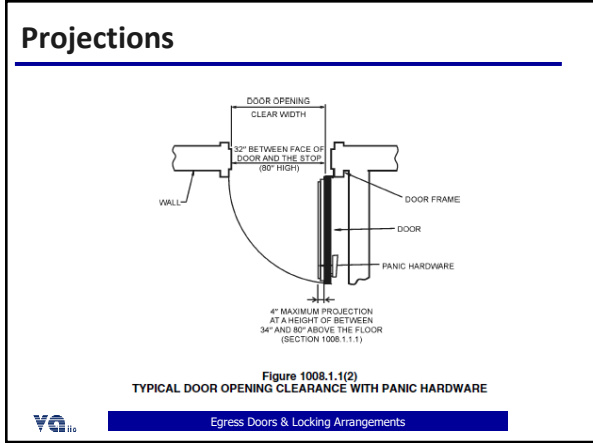
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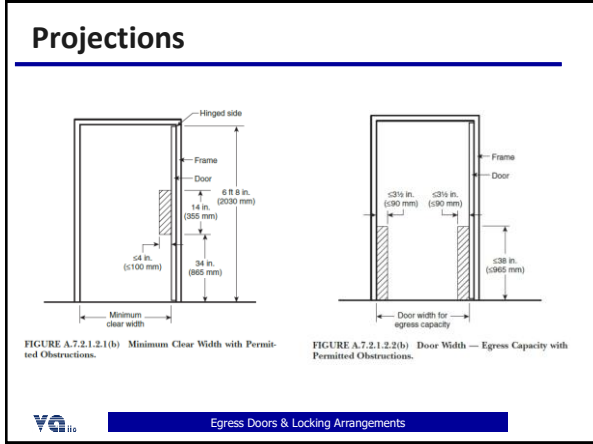
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### Headroom

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



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### Door Swing Direction



**Direction of egress travel**

- $\geq 50$  people
- Exit stair enclosure – other than living units
- High hazard
- Horizontal exit

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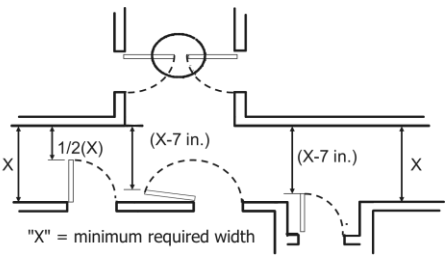
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### Door Leaf Encroachment



"X" = minimum required width

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### Door Leaf Encroachment

1/2 required width

7" Max

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### 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

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### Opening Forces

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

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### Opening Forces



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### Opening Forces



YO **Egress Doors & Locking Arrangements**

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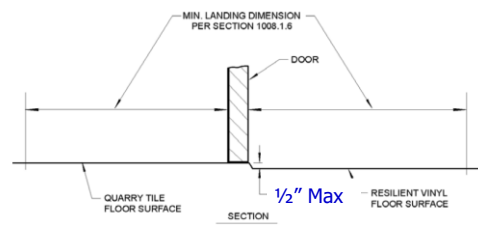
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### Floor Level



sh = 2

Figure 1008.1.5  
DOOR LANDINGS

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### Floor Level - landings



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### Floor Level - landings

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



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### Thresholds

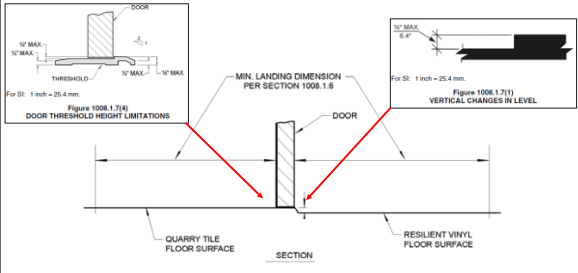


Figure 1008.1.7(4) DOOR THRESHOLD HEIGHT LIMITATIONS

Figure 1008.1.7(1) VERTICAL CHANGES IN LEVEL

Figure 1008.1.5 DOOR LANDINGS

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### Doors in Series

4" MIN.

4" MIN.

For SI: 1 foot = 304.8 mm.

Figure 1008.1.R(1)  
SPACING OF DOORS IN SERIES

Figure 1008.1.R(1)  
SPACING OF DOORS IN SERIES

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### Doors in Series

48" MIN  
1220

60° TURNING SPACE  
BETWEEN DOORS

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

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### Maneuvering Clearances

60 mm  
1525

18 mm  
455

(a) Front Approach, Pull Side

12 mm  
305

48 mm  
1220

"If both closer and latch are provided"  
(b) Front Approach, Push Side

35 mm  
915

60 mm  
1525

(c) Hinge Approach, Pull Side

42 mm  
1065

64 mm  
1625

(d) Hinge Approach, Push Side

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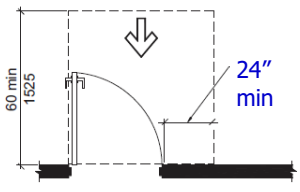

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### Maneuvering Clearances



(a) Front Approach, Pull Side

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### Door Surface



FIGURE C404.2.9(a)  
DOOR SURFACE OBSTRUCTION

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### Doors in Series



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### Doors in Series

Man-Trap



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### Door Locking



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

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### Obvious Method of Release



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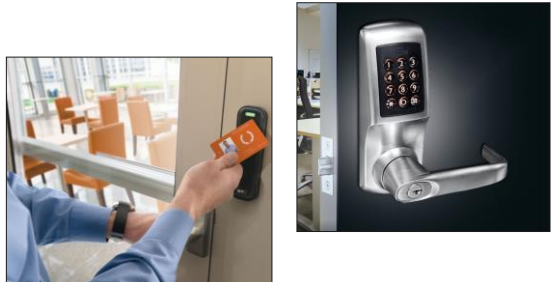
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### Obvious Method of Release



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### Tight Grasping

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



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### Key-Operated

A (OL ≤ 300), B, F, M, S, & religious worship



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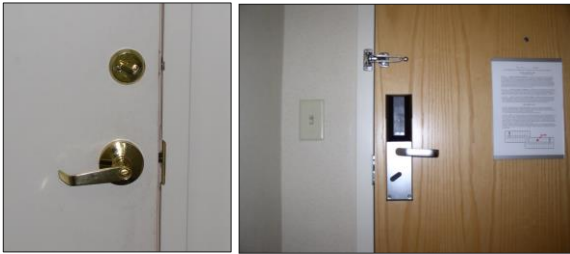
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### Releasing Operations

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



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### 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*

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### Panic/Fire Exit Hardware



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### Panic/Fire Exit Hardware

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### Fire Exit Hardware

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Fusible Alignment Pin

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### Panic/Fire Exit Hardware

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### Delayed Egress

Prohibited in A, E, & H



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### Alarmed Egress



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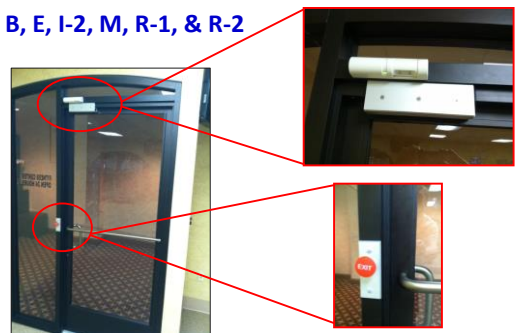
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### Access Controlled

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



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### Electromagnetically locked

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



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### Patient Room Doors



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

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### Correctional Facilities

New



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

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### Clinical or Security Needs

I-1 & I-2



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

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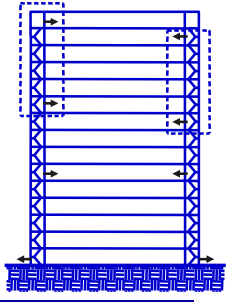
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### Stairwell Re-entry



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### Door Swing Alternatives

B, F, M, & S



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**Door Swing Alternatives**

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**Horizontal Sliding Door**



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**Door Swing Alternatives**

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**Manual sliding**



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**Door Swing Alternatives**

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**Manual sliding**



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**Door Swing Alternatives**

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**Revolving Door**



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**Door Swing Alternatives**

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**Revolving Door**



**VO** Egress Doors & Locking Arrangements

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**Door Swing Alternatives**

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**Healthcare**



**VO** Egress Doors & Locking Arrangements

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**Door Swing Alternatives**

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**Powered Doors**



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**Door Swing Alternatives**

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**Turnstiles**



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**Door Swing Alternatives**

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**Turnstiles ?**



**VO** Egress Doors & Locking Arrangements

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## Opening Protection

**TABLE 716.5  
OPENING FIRE PROTECTION ASSEMBLIES, RATINGS AND MARKINGS**

TYPE OF ASSEMBLY	REQUIRED WALL ASSEMBLY RATING (hours)	MINIMUM FIRE DOOR AND SHUTTER ASSEMBLY RATING (hours)	DOOR VIEW PANE L PANEL SIZE	FIRE RATED GLAZING MARKING DOOR VIEW PANE L*	MINIMUM SIDELIGHT/TRANSOM ASSEMBLY RATING (hours)		FIRE-RATED GLAZING MARKING SIDELIGHT/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 <sup>1</sup> / <sub>2</sub>	Not Permitted	Not Permitted	Not Permitted	3	Not Permitted	W-180
	2	1 <sup>1</sup> / <sub>2</sub>	100 sq. in. <sup>1</sup>	≤100 sq. in. = D-H-90 >100 sq. in. <sup>2</sup> = D-H-W-90	Not Permitted	2	Not Permitted	W-120
Shaft, exit enclosures and exit passageway walls	1 <sup>1</sup> / <sub>2</sub>	1 <sup>1</sup> / <sub>2</sub>	100 sq. in. <sup>1</sup>	≤100 sq. in. = D-H-90 >100 sq. in. <sup>2</sup> = D-H-W-90	Not Permitted	1 <sup>1</sup> / <sub>2</sub>	Not Permitted	W-90
	2	1 <sup>1</sup> / <sub>2</sub>	100 sq. in. <sup>1</sup>	≤100 sq. in. = D-H-90 >100 sq. in. <sup>2</sup> = 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. <sup>1</sup>	≤100 sq. in. = D-H-60 >100 sq. in. <sup>2</sup> = D-H-T or D-H-T-W-60	Not Permitted	1	Not Permitted	W-60



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## Opening Protection

TYPE OF ASSEMBLY	REQUIRED WALL ASSEMBLY RATING (hours)	MINIMUM FIRE DOOR AND SHUTTER ASSEMBLY RATING (hours)	DOOR VIEW PANE L PANEL SIZE	FIRE RATED GLAZING MARKING DOOR VIEW PANE L*	MINIMUM SIDELIGHT/TRANSOM ASSEMBLY RATING (hours)		FIRE-RATED GLAZING MARKING SIDELIGHT/TRANSOM PANEL	
					Fire protection	Fire resistance	Fire protection	Fire resistance
Other fire barriers	1	1/2	Maximum size tested	D-H-NT-45	1/2			D-H-NT-45
Fire partitions: Corridor walls	1	1/2	Maximum size tested	D-20	1/2			D-H-OH-45
	0.5	1/2	Maximum size tested	D-20	1/2			D-H-OH-20
Other fire partitions	1	1/2	Maximum size tested	D-H-45	1/2			D-H-45
	0.5	1/2	Maximum size tested	D-H-20	1/2			D-H-20



Egress Doors & Locking Arrangements

## Opening Protection

**TABLE 716.5(1)  
MARKINGS OF FIRE RATED GLAZING<sup>1</sup>**

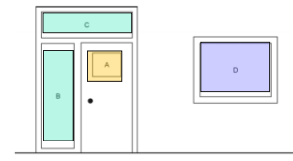
TYPE OF ASSEMBLY	REQUIRED WALL ASSEMBLY RATING (hours)	DOOR VIEW PANE L 2 100 SF OR LESS	DOOR VIEW PANE L 2 >100 SF	SIDELITE OR TRANSOM PANELS B & C	WINDOW ASSEMBLY D
Fire wall and fire barrier wall	4-hr	Not Permitted	Not Permitted	W-240 <sup>2</sup>	W-240 <sup>2</sup>
	3-hr	Not Permitted	Not Permitted	W-180 <sup>2</sup>	W-180 <sup>2</sup>
	2-hr	[D-H-90]	[D-H-W-90] <sup>3</sup>	W-120 <sup>2</sup>	W-120 <sup>2</sup>
	1 <sup>1</sup> / <sub>2</sub> -hr	[D-H-90]	[D-H-W-90] <sup>3</sup>	W-90 <sup>2</sup>	W-90 <sup>2</sup>
Shaft, exit enclosures and exit passageway walls	2-hr	[D-H-90]	[D-H-W-90] <sup>3</sup> or [D-H-T-W-90] <sup>3</sup>	W-120 <sup>2</sup>	W-120 <sup>2</sup>
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] <sup>3</sup>	W-60 <sup>2</sup>	W-60 <sup>2</sup>
Other fire barriers	1-hr	[D-H-NT-45]	[D-H-NT-45]	[D-H-NT-45]	W-60 <sup>2</sup>
Fire barriers - incidental use areas, beyond occupancy separations	1-hr	[D-H-NT-45]	[D-H-NT-45]	[D-H-NT-45]	[CH-45] or W-60 <sup>2</sup>
Fire partitions: Corridor walls	1-hr	[D-20]	[D-20]	[D-H-OH-45]	[CH-45] or W-60 <sup>2</sup>
	0.5-hr	[D-20]	[D-20]	[D-H-OH-20]	[CH-20] or W-30 <sup>2</sup>
Other fire partitions	0.5-hr	[D-H-20]	[D-H-20]	[D-H-20]	[CH-20] or W-30 <sup>2</sup>
Smoke barriers	1-hr	[D-20]	[D-20]	[D-H-OH-45]	[CH-45] or W-60 <sup>2</sup>
	3-hr	[D-H-90]	[D-H-W-90] <sup>3</sup>	W-180 <sup>2</sup>	[CH-90] or W-180 <sup>2</sup>
Exterior walls <sup>4</sup>	2-hr	[D-H-90]	[D-H-W-90] <sup>3</sup>	W-120 <sup>2</sup>	[CH-90] or W-120 <sup>2</sup>
	1-hr	[D-H-45]	[D-H-45]	[D-H-45]	[CH-45] or W-60 <sup>2</sup>

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 252 or U.L.C.  
 2. Fire resistance-rated glazing meeting ASTM E 119 or U.L.C. 308.  
 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 U.L.C. 308).  
 4. Glazing requirements where protected openings are required by Table 703.8.  
 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 (RFR)	DOOR VIEW PANEL A 100 IN² OR LESS	DOOR VIEW PANEL A > 100 IN²	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 <sup>2</sup>
	0.5-hr	[D-20]	[D-20]	[D-H-OH-20]	[OH-20] or W-30 <sup>2</sup>

**VO** Egress Doors & Locking Arrangements

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### 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.

**VO** Egress Doors & Locking Arrangements

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### 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 holstways	2	1½	NP
	1	1	NP
Vertical shafts (including stairways, exits, and refuse chutes)	2	1½	NP
	1	1	NP (3/4 in other than exits)
	½	1/3	NP (1/3 in other than exits)
Fire barriers	2	1½	NP
Horizontal exits	1	¾	¾
Exit access corridors <sup>1</sup>	2	1½	NP
	1	1/3	¾
Smoke barriers <sup>1</sup>	½	1/3	1/3
	¾	1/3	¾

**VO** Egress Doors & Locking Arrangements

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### Existing Stair Doors

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**YO** Egress Doors & Locking Arrangements

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### Fire Door Basics

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**YO** Egress Doors & Locking Arrangements

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### Fire Door Basics

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**YO** Egress Doors & Locking Arrangements

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### Fire Door Basics



**UL** LISTED DOOR 1H10E 8819 F-45

**VO** Egress Doors & Locking Arrangements

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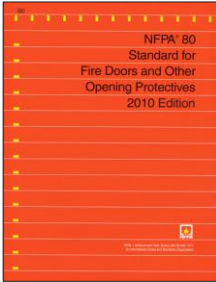
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### NFPA 80



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

**VO** Egress Doors & Locking Arrangements

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### Fire Doors

#### NFPA 80



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

**VO** Egress Doors & Locking Arrangements

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**All Egress Doors**

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**CFSC Part IV**



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

 Egress Doors & Locking Arrangements

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**I Got Nothing**

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 Egress Doors & Locking Arrangements

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Questions or Comments

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