DeCoded

Fire Door Assemblies

Lori Greene, AHC/CDC, CCPR, FDAI, FDHI

Welcome!

Notes about today's webinar…

- 2nd in DHI Webinar series
  - Recording of *Accessibility Requirements* webinar available on DHInteractiv in Members Only
  - Handout for today's webinar available now

- 1 hr. 15 min. presentation
- 15 min. Q & A at the end
  - Submit questions via Chat/Question box

- All attendees muted

Welcome!

Notes about today's webinar…

- 5 DHI CEP pts. are available for each 1 ½ hr. webinar.
- A recording of today's webinar will be available on DHInteractiv
  - Handouts and additional information
  - Notified via email when available
  - Go to ***DHInteractive***
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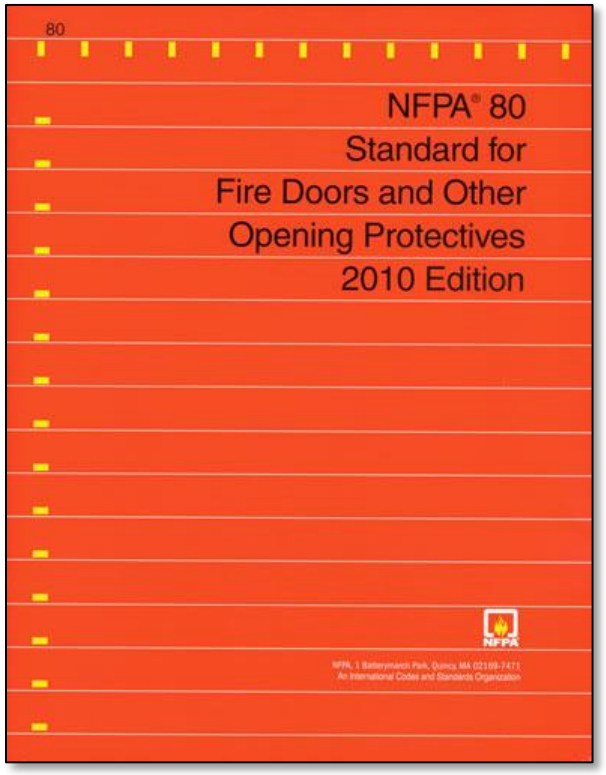
  - Click on ***Members Only***

Session 2 – Fire Doors

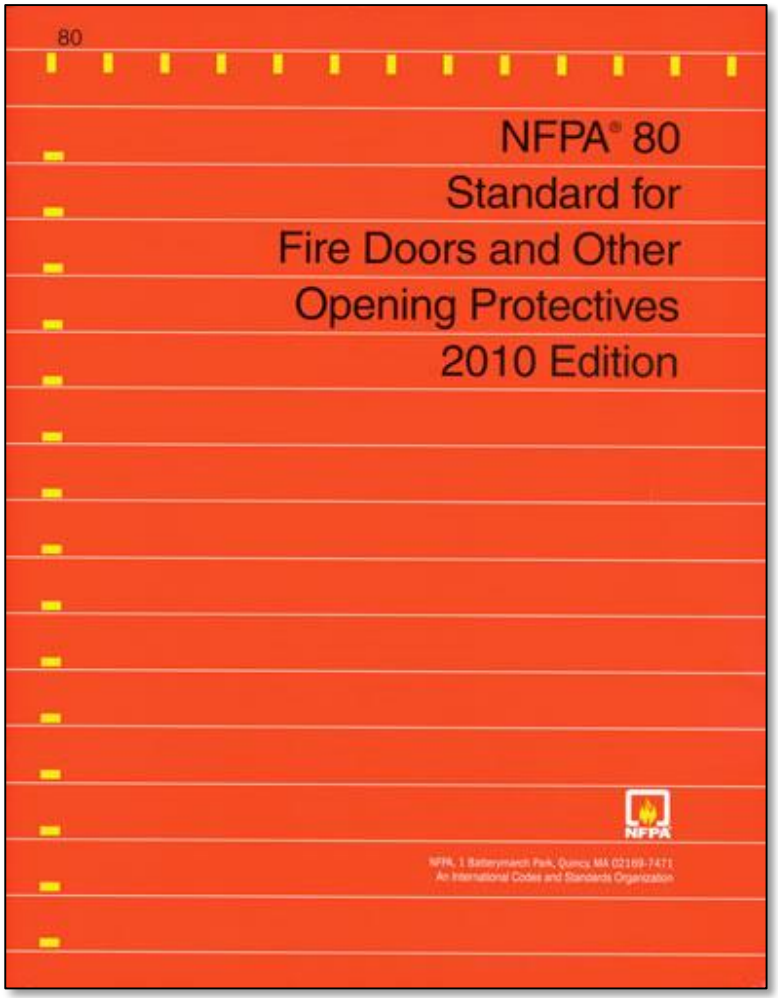
- NFPA 80 – format and organization
- Purpose of fire doors
- Fire ratings and testing
- Basic fire door requirements
- Fire Door Assembly Inspection



www.iDigHardware.com/decoded-dhi

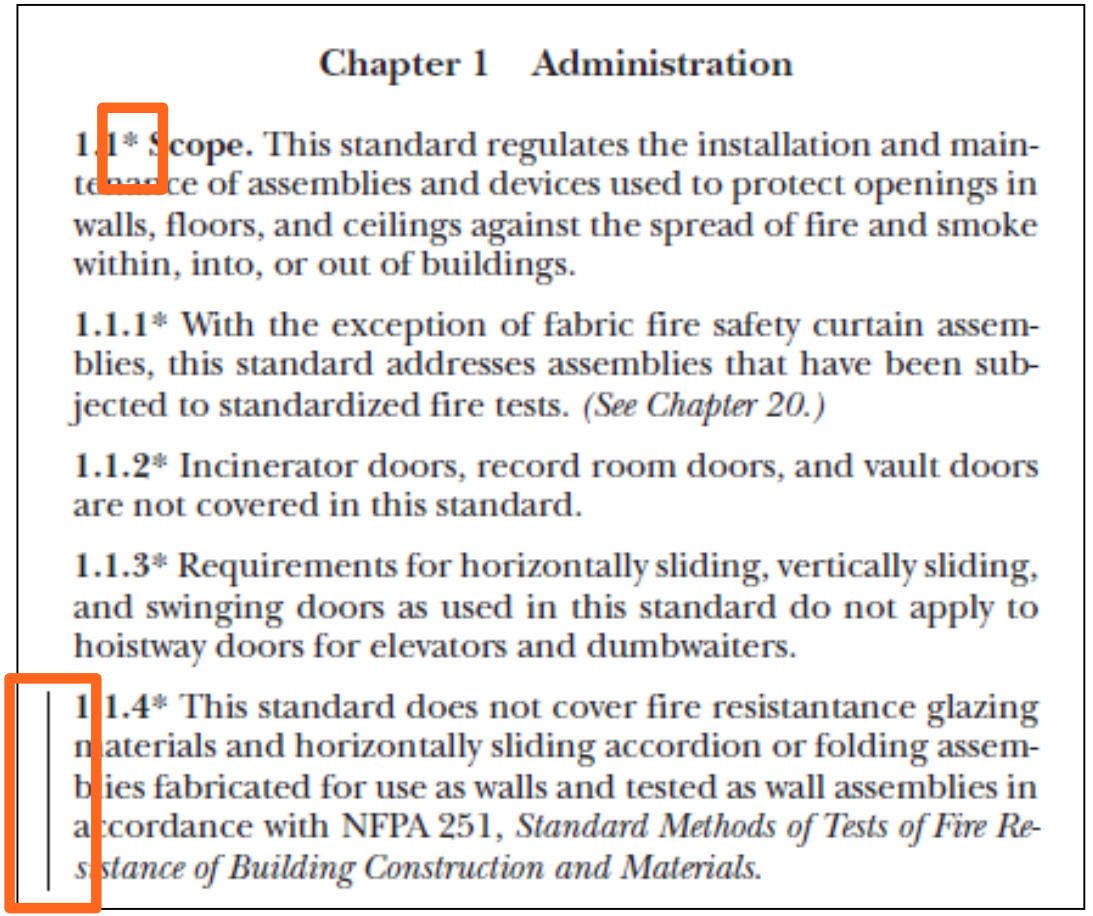
NFPA 80

- NFPA 80 details the requirements for fire doors.
- NFPA 80 does not state where fire doors are required.
- Referenced by the IBC, NFPA 101, and other codes.
- **Recent Editions: 1999, 2007, 2010, 2013**



NFPA 80

- * = More information in Annex A – Explanatory Material
- | = Revised in the last code change cycle.



Chapter 1 Administration

1.1* Scope. This standard regulates the installation and maintenance of assemblies and devices used to protect openings in walls, floors, and ceilings against the spread of fire and smoke within, into, or out of buildings.

1.1.1* With the exception of fabric fire safety curtain assemblies, this standard addresses assemblies that have been subjected to standardized fire tests. *(See Chapter 20.)*

1.1.2* Incinerator doors, record room doors, and vault doors are not covered in this standard.

1.1.3* Requirements for horizontally sliding, vertically sliding, and swinging doors as used in this standard do not apply to hoistway doors for elevators and dumbwaiters.

1.1.4* This standard does not cover fire resistantance glazing materials and horizontally sliding accordion or folding assemblies fabricated for use as walls and tested as wall assemblies in accordance with NFPA 251, *Standard Methods of Tests of Fire Resistance of Building Construction and Materials.*

NFPA 80 – Standard for Fire Doors and Other Opening Protectives

- Chapter 1 – Administration
- Chapter 2 – Referenced Publications
- Chapter 3 – Definitions
- Chapter 4 – General Requirements
- Chapter 5 – Care and Maintenance
- **Chapter 6 – Swinging Doors with Builders Hardware**
- **Chapter 7 – Swinging Doors with Fire Door Hardware**
- Chapters 8-20 – Other Types of Doors, Glass Block, Dampers, Curtains
- Annexes

Swinging Doors with Builders Hardware

Swinging and Sliding Doors with Fire Door Hardware

Classification of Openings

- Class A—Openings in fire walls and in walls that divide a single building into fire areas
- Class B—Openings in enclosures of vertical communications through buildings and in 2-hour rated partitions providing horizontal fire separations
- Class C —Openings in walls or partitions between rooms and corridors having a fire resistance rating of 1 hour or less
- Class D—Openings in exterior walls subject to severe fire exposure from outside the building
- Class E—Openings in exterior walls subject to moderate or light fire exposure from outside the building

Fire Door Ratings

- Typical Ratings (US)
  - A – 3 hours
  - B – 90 minutes or 60 minutes
  - C – 45 minutes
  - 20 minutes

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 [b]	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	1 1/2	100 sq. in.[c]	≤100 sq.in. = D-H-90 >100 sq.in.= D-H-W-90	Not Permitted	2	Not Permitted	W-120
	1 1/2	1 1/2	100 sq. in.[c]	≤100 sq.in. = D-H-90 >100 sq.in.= D-H-W-90	Not Permitted	1 1/2	Not Permitted	W-90
Shaft, exit enclosures and exit passageway walls	2	1 1/2	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

					Fire protection	
Other fire barriers	1	3/4	Maximum size tested	D-H-NT-45	3/4	D-H-NT-45
Fire partitions: Corridor walls	1	1/3[b]	Maximum size tested	D-20	3/4[b]	D-H-OH-45
	0.5	1/3[b]	Maximum size tested	D-20	1/3	D-H-OH-20
Other fire partitions	1	3/4	Maximum size tested	D-H-45	3/4	D-H-45
	0.5	1/3	Maximum size tested	D-H-20	1/3	D-H-20

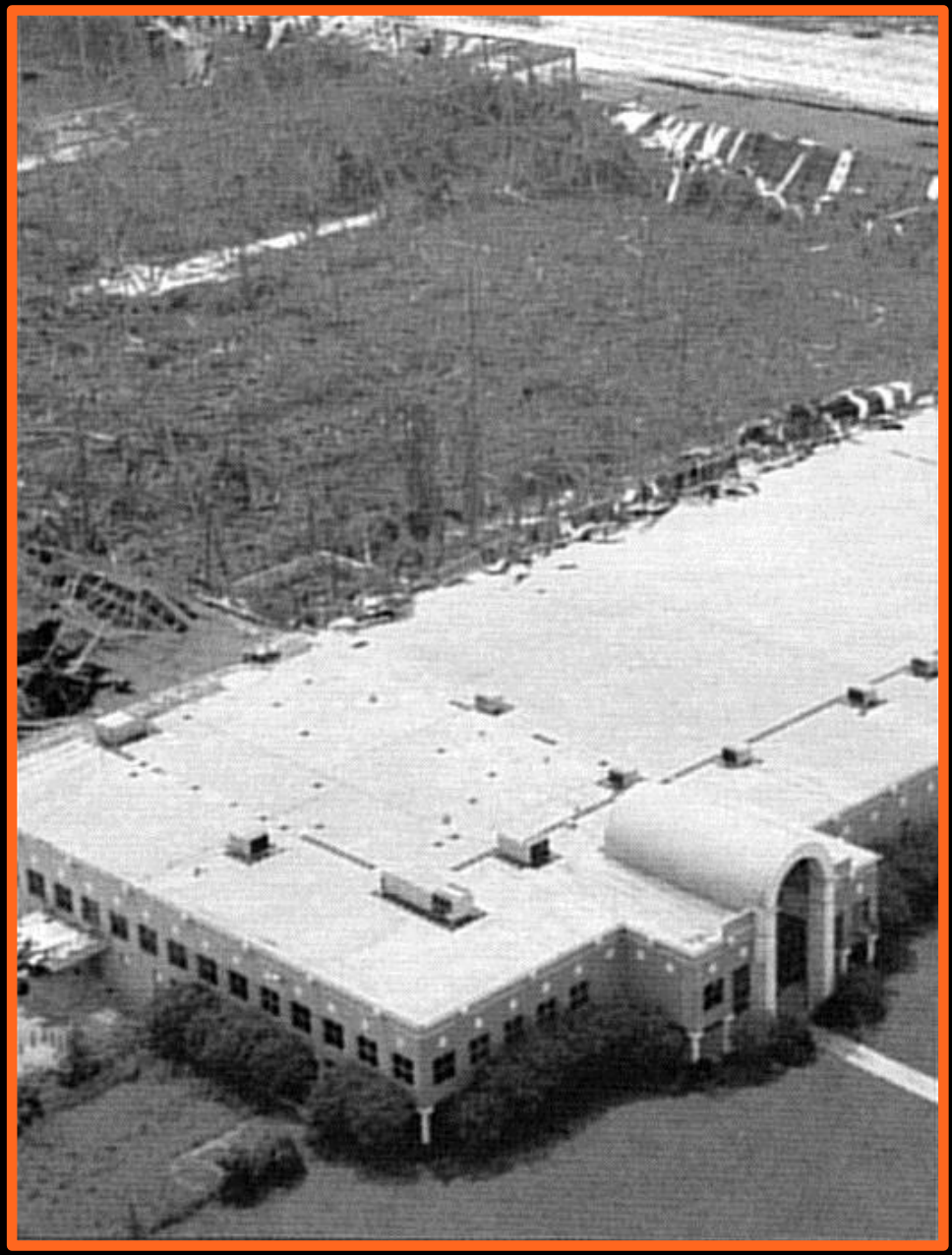
TYPE OF ASSEMBLY	REQUIRED WALL ASSEMBLY RATING (hours)	MINIMUM FIRE DOOR AND FIRE SHUTTER ASSEMBLY RATING (hours)	DOOR VISION PANEL SIZE	FIRE RATED GLAZING MARKING DOOR VISION PANEL[a]	MINIMUM SIDELIGHT/ TRANSOM ASSEMBLY RATING (hours)		FIRE-RATED GLAZING MARKING SIDELITE/TRANSOM PANEL	
					Fire protection	Fire resistance	Fire protection	Fire resistance
Exterior walls	3	1 1/2	100 sq. in.[c]	≤100 sq.in. = D-H-90 >100 sq.in = D-H-W-90	Not Permitted	3	Not Permitted	W-180
	2	1 1/2	100 sq. in.[c]	≤100 sq.in. = D-H-90 >100 sq.in.= D-H-W-90	Not Permitted	2	Not Permitted	W-120
					Fire Protection			
	1	3/4	Maximum size tested	D-H-45	3/4		D-H-45	
Smoke barriers					Fire protection			
	1	1/3[b]	Maximum size tested	D-20	3/4		D-H-OH-45	

What's the point?

History has shown us the importance of operational fire and egress doors.

A warehouse fire in 1996 left only the part of the building protected by fire doors intact.

Source: NFPA Journal



The Robert Moses Nature Center was protected by this fire door.

Properly Closed
Fire Door
Prevented Fire
Damage To This
Entire Section of
The Building
NATURE
CENTER


5


APR 26 2006


36


@ Juan Guerra


0:00:14 / 0:00:31

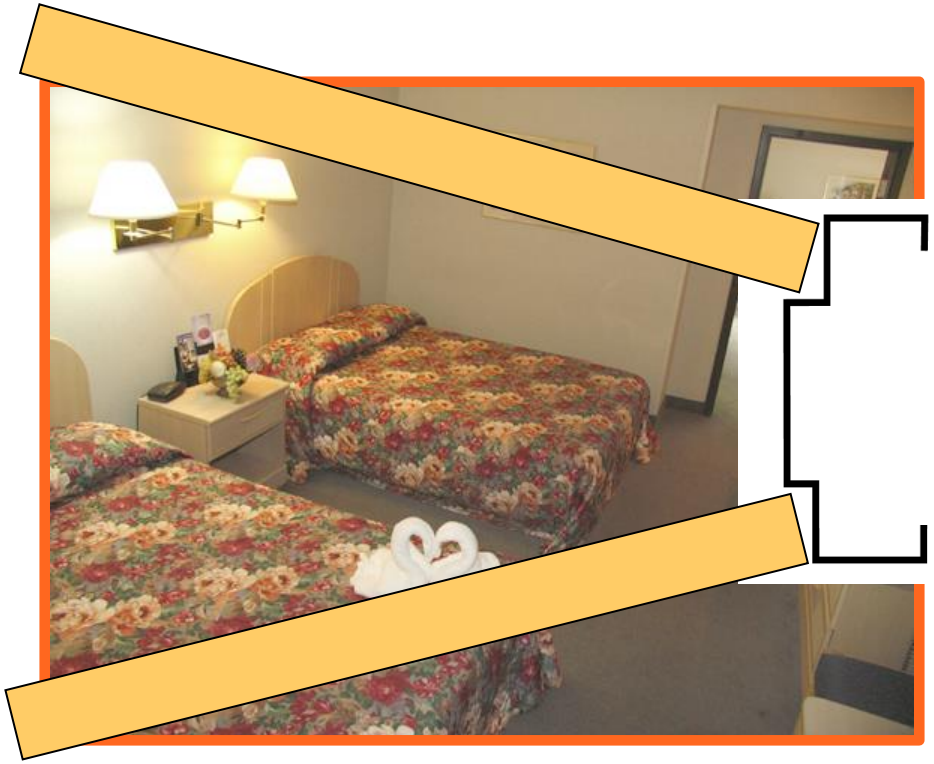
Fire doors must be closed and latched at the time of a fire.

Operation of Doors – NFPA 80

- *Self-Closing Doors. Doors that, when opened and released, return to the closed position.*
- *Automatic-Closing Door. A door that normally is open but that closes when the automatic-closing device is activated.*
  - *Automatic-Closing Device. A device that causes the door or window to close when activated by a fusible link or detector.*
  - Annex A recommends that these doors are closed when building is unoccupied.
- *Power-Operated Fire Doors. Doors that normally are*
- *opened and closed electrically or pneumatically*
  - Must be deactivated upon fire alarm.

Exception

- Fire doors in common walls between R-1 sleeping units
- AKA communicating doors between hotel rooms

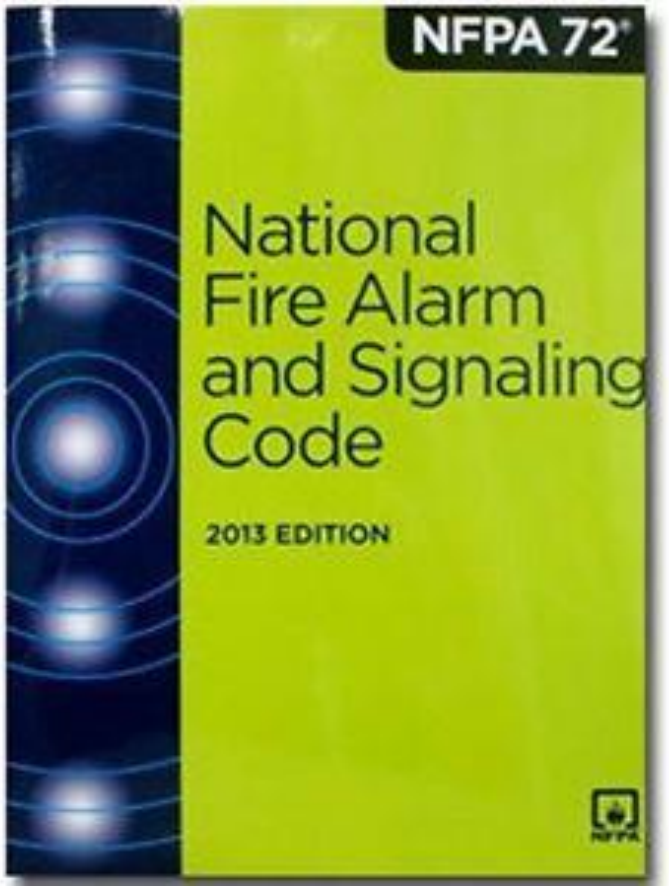


Exception

- Inactive leaf of rated pair to room not normally occupied by people
  - Boiler room
  - Electric room
  - Mechanical room

Acceptable Ways to Hold Open a Fire Door

- Non-detectored electronic hold-open unit released by fire alarm.
- Electronic hold-open unit with on-board detector.



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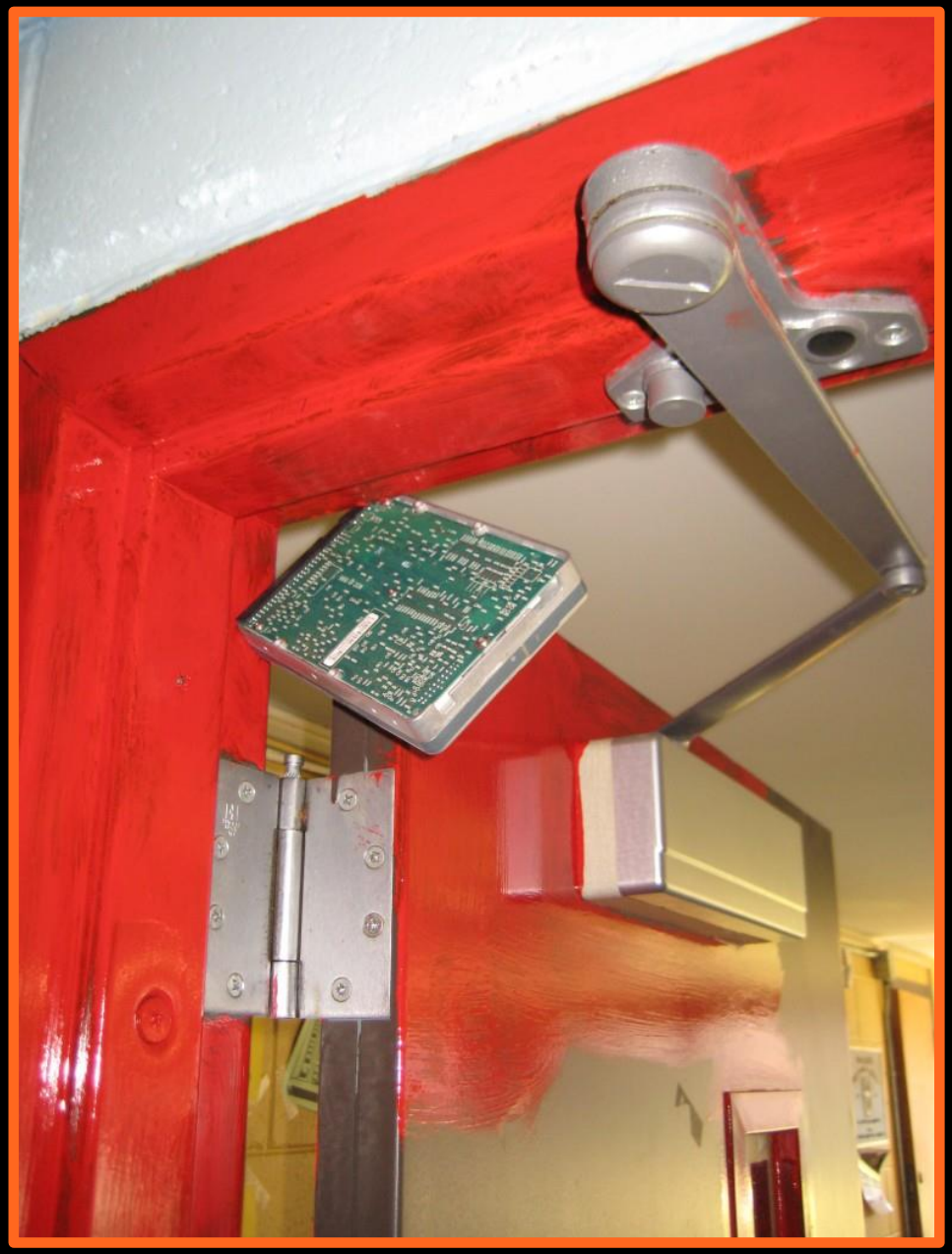

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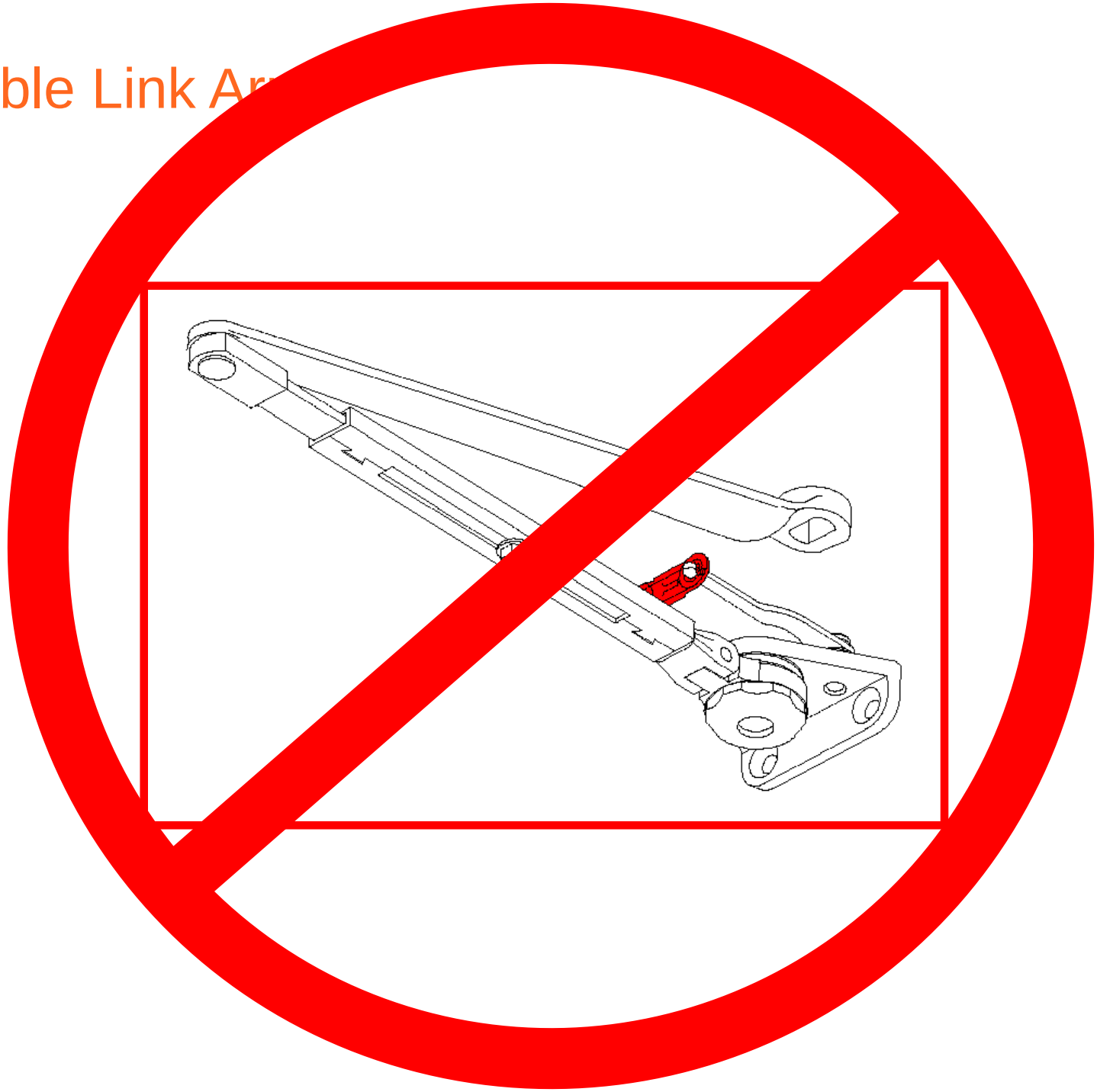
Fusible Link Ar

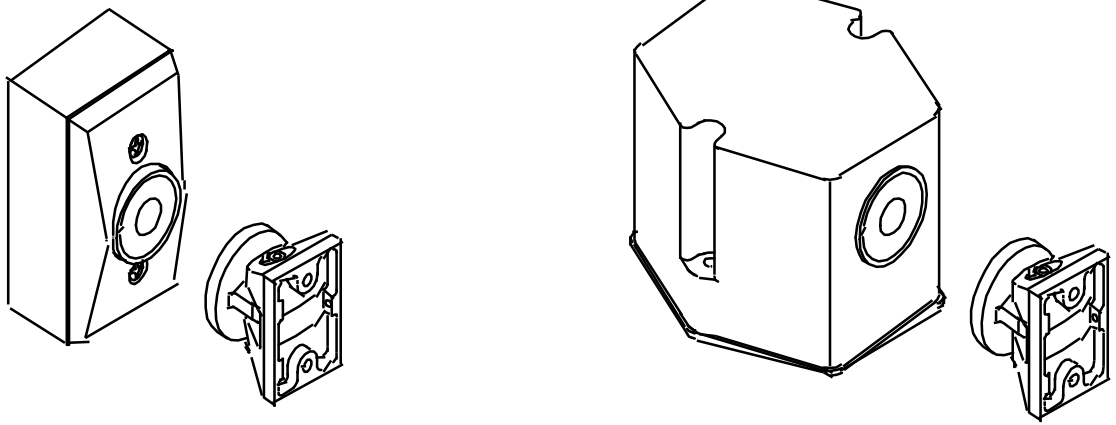


Fusible Link Arm

- Current codes require smoke-actuated hold-opens for almost all fire door locations.

Acceptable Ways to Hold Open a Fire Door

- wall or floor magnet with closer



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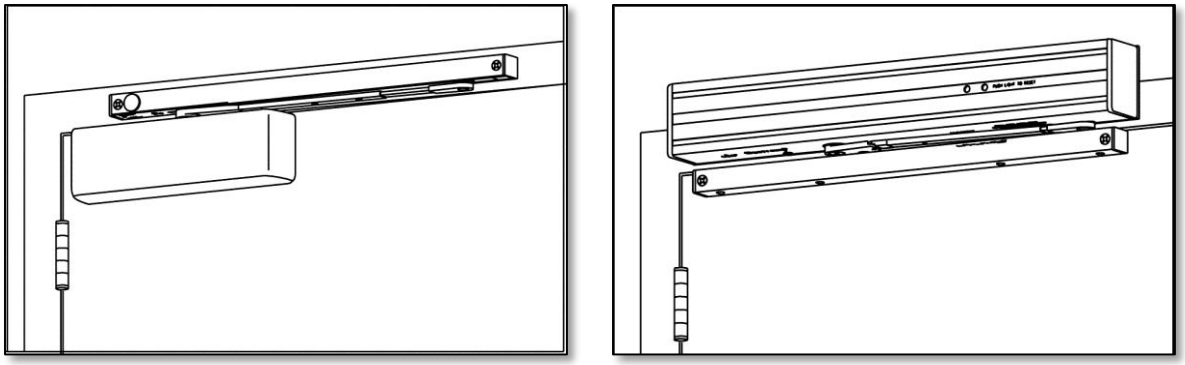
Acceptable Ways to Hold Open a Fire Door

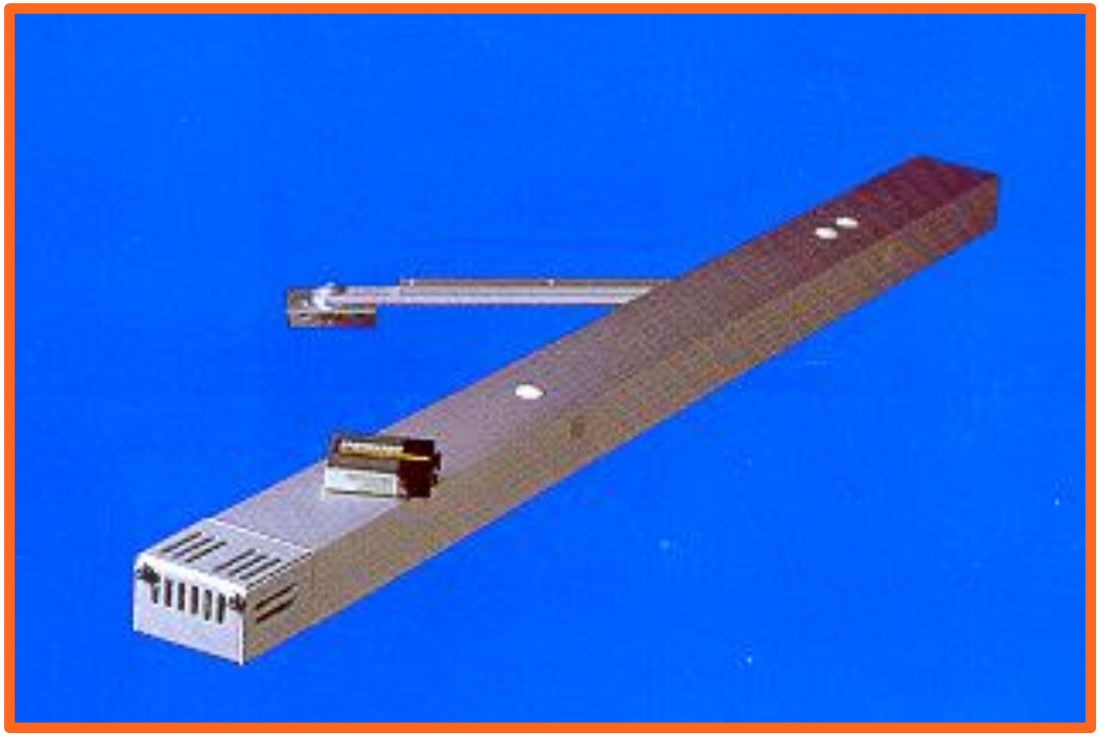
- electro-magnetic hold-open closer



A positive stop MUST be used with closer/holders.

Acceptable Ways to Hold Open a Fire Door

- battery-operated detectored holder with closer



Stair Enclosures

- NFPA 101: *“The release by means of smoke detection of one door in a stair enclosure results in closing all doors serving that stair.”*

Self Latching
Positive Latching

- Must have an active latch bolt

Not OK

Latch Throw

NFPA 80 – 2007/10/13:

6.4.4.6 Throw.

6.4.4.6.1 *The throw of single-point latch bolts shall not be less than the minimum shown on the fire door label.*

6.4.4.6.2 *The minimum throw shall be as specified in the manufacturer's installation instructions.*

In previous editions, a minimum latch throw was spelled out in NFPA 80.

Self Latching
Positive Latching

- No Mechanical Dogging

Self Latching
Positive Latching

- No Mechanical Dogging

Latch may be held back using electric latch retraction and must release on fire alarm.

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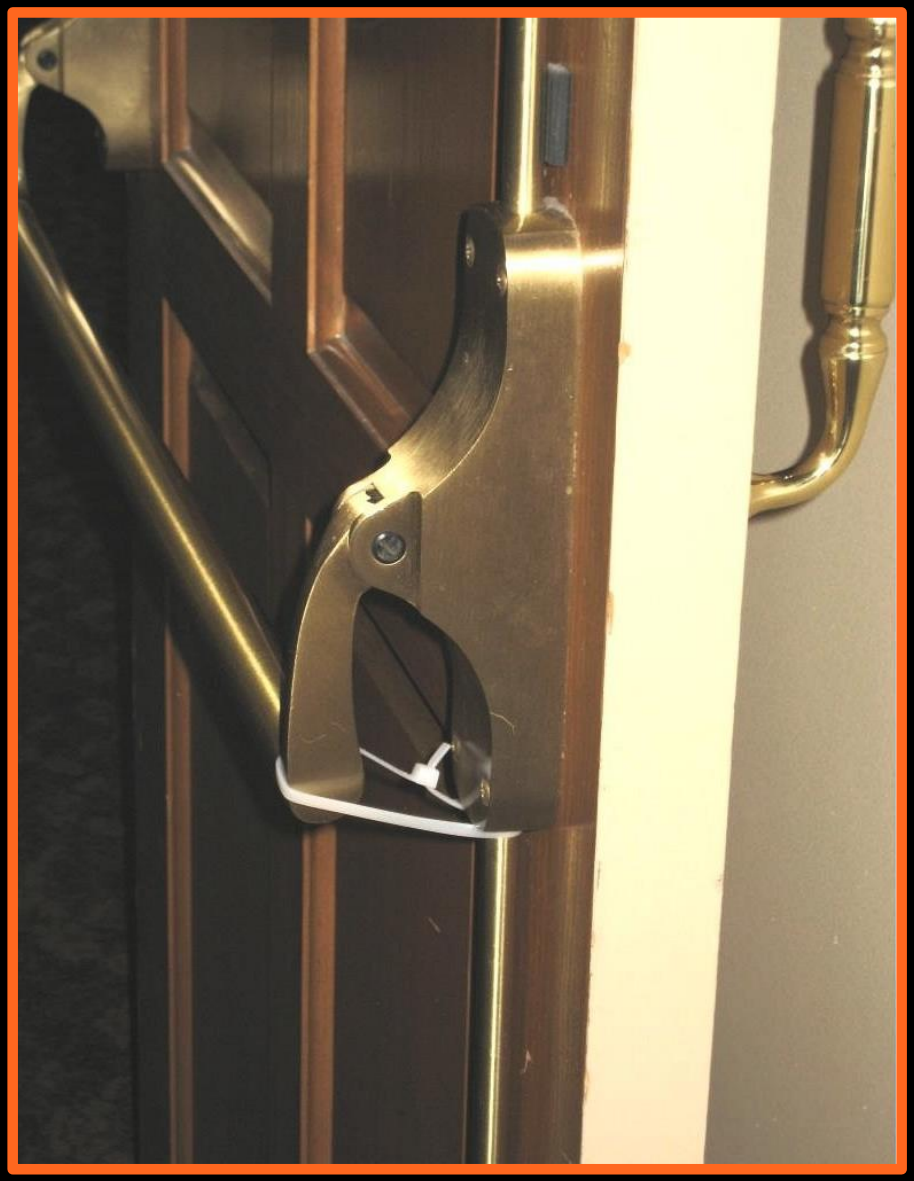


Self Latching
Positive Latching

- Electric Strikes – must be Fail Secure
  - Fail Secure – When power fails, keeper is secure
  - Fail Safe – When power fails, keeper is free

Open Back Strikes

NFPA 80 – 2007/10/13:

6.4.4.10* *Open back strikes shall be permitted to be used in lieu of conventional strikes only where specifically provided*

for in the published listings.

Self Latching
Positive Latching

- Automatic Flush Bolts
  - No “Dummy” Trim on Egress Side
  - Coordinator Required

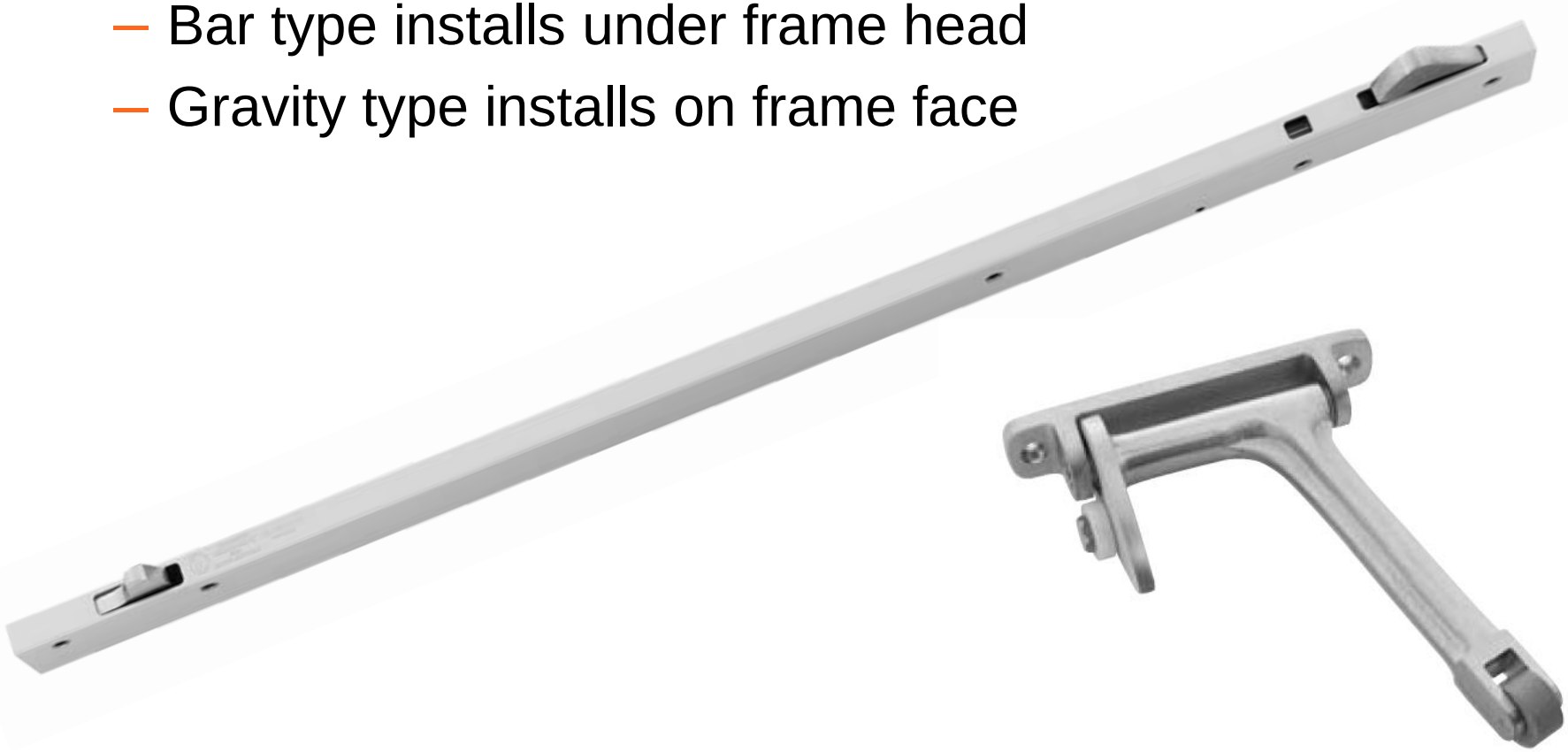
Flush Bolts

manual

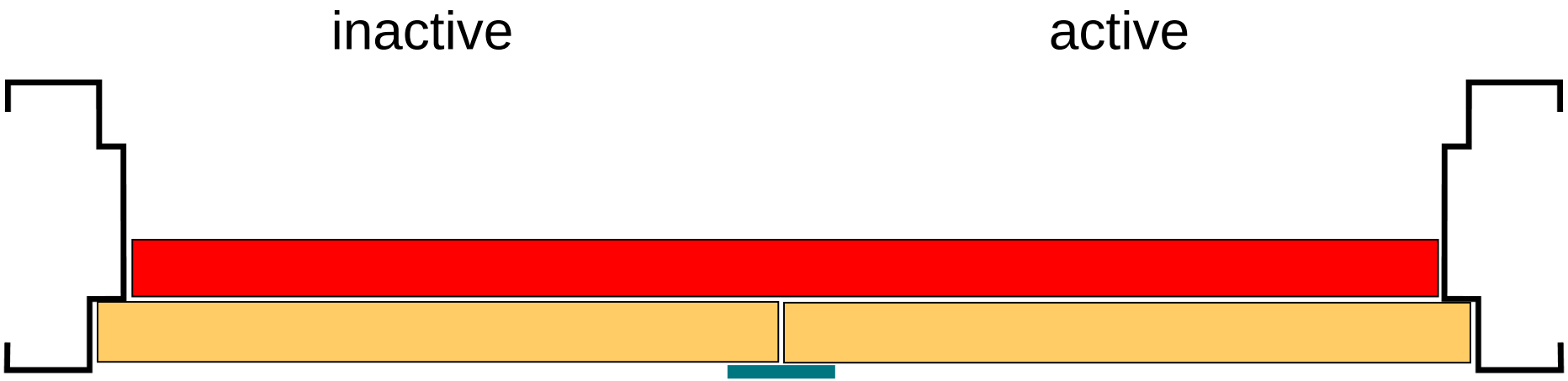
automatic

Door Coordinators

- Pairs of doors with automatic flush bolts or astragals
- Coordinates closing of doors so correct door closes first
- Bar type and gravity type
  - Bar type installs under frame head
  - Gravity type installs on frame face



Door Coordinator



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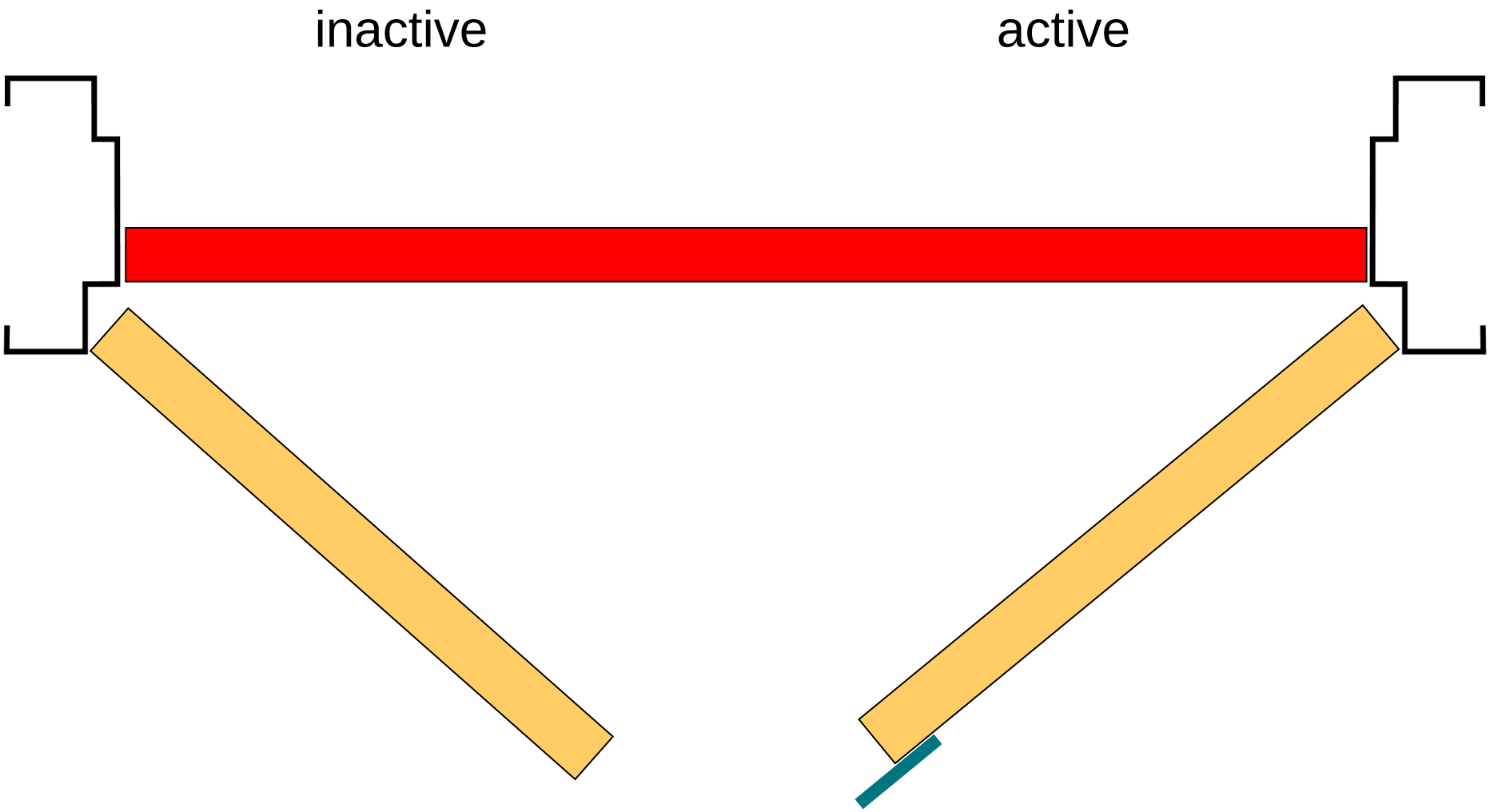

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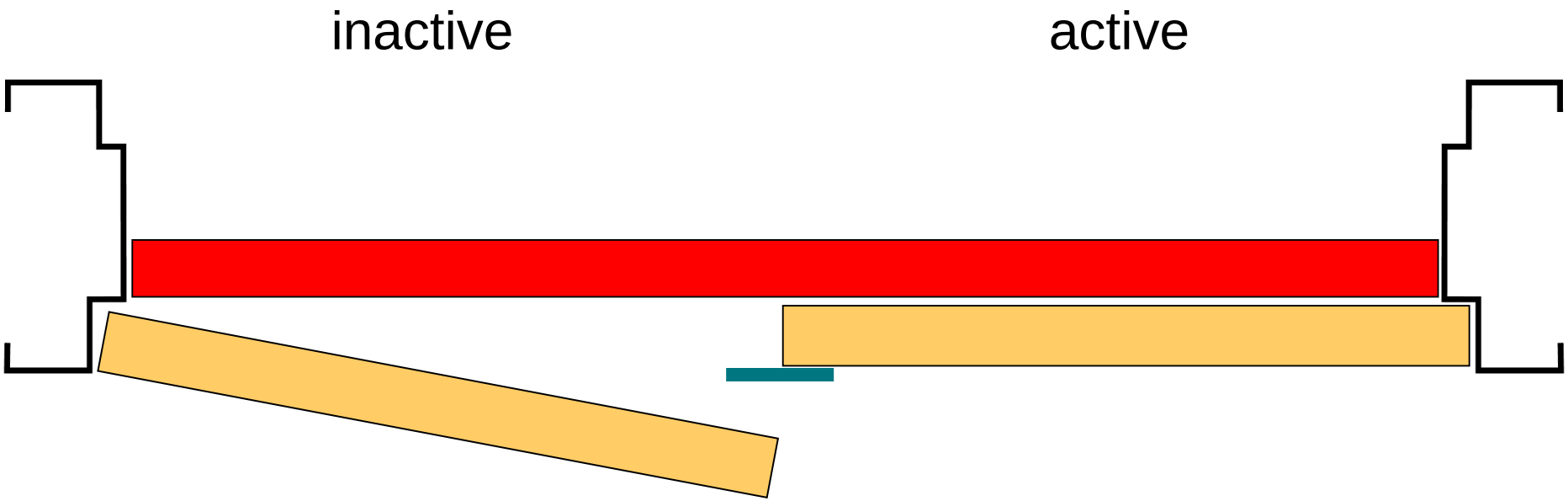
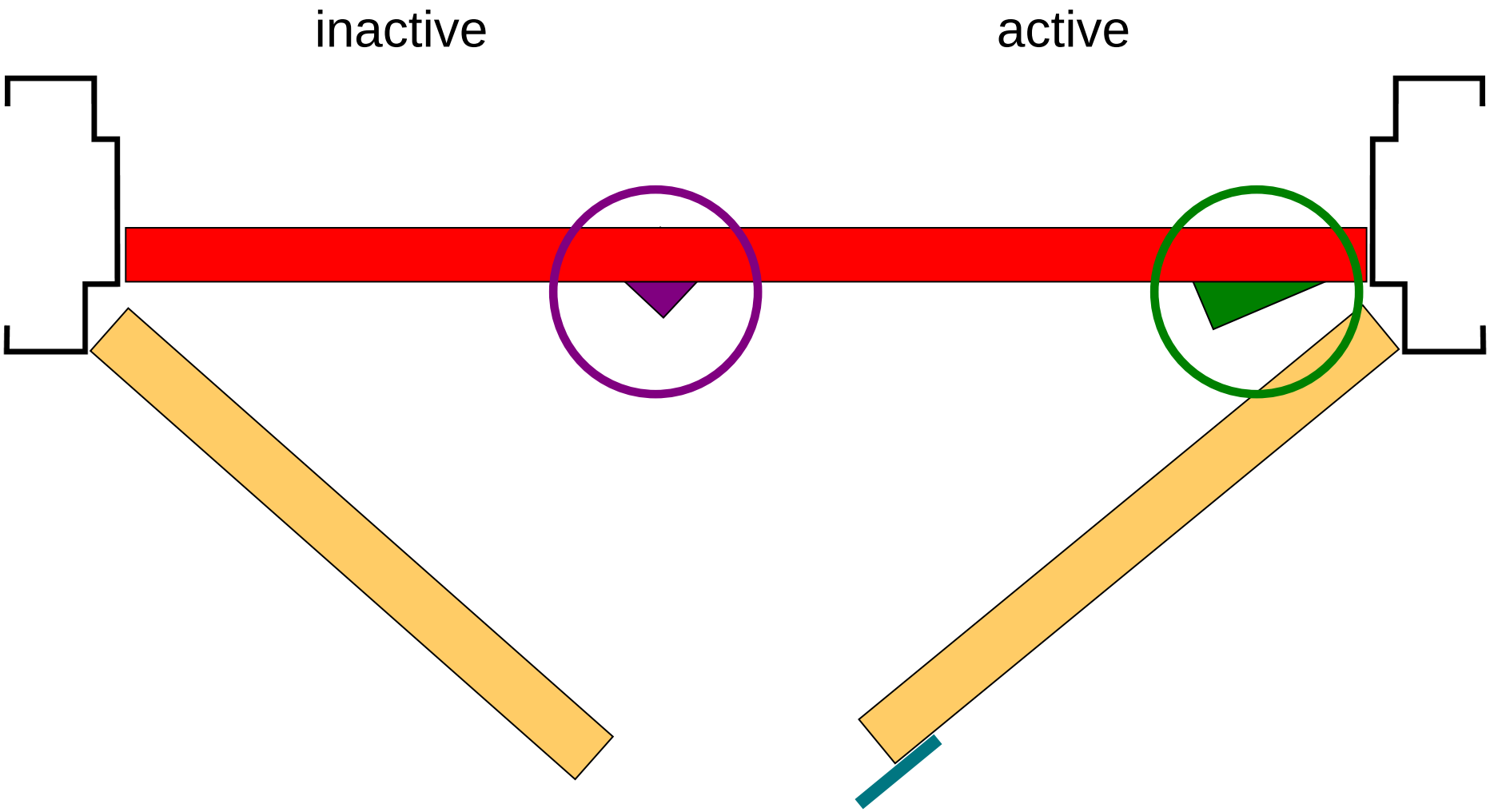


Door Coordinators

Door Coordinator



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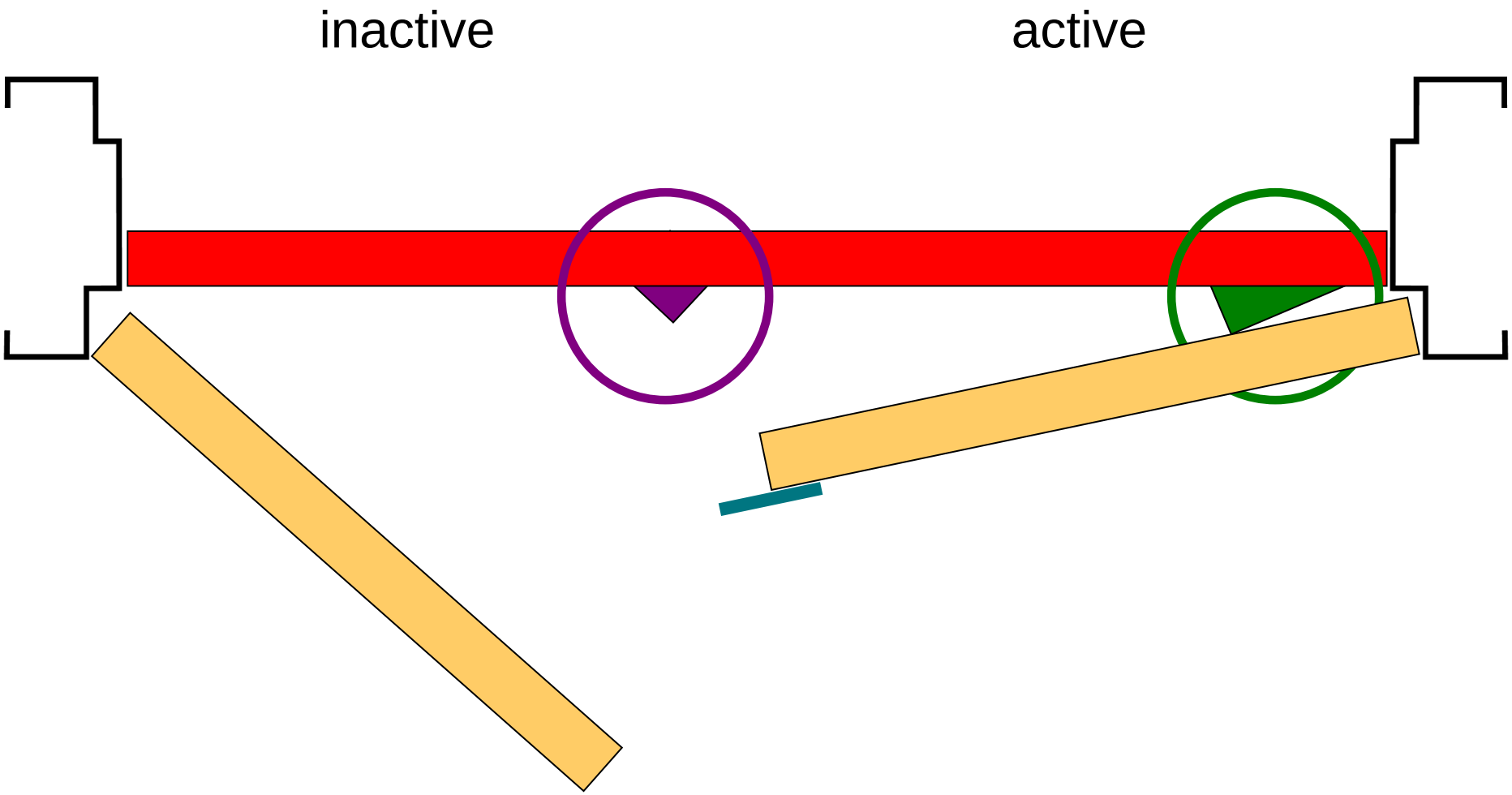

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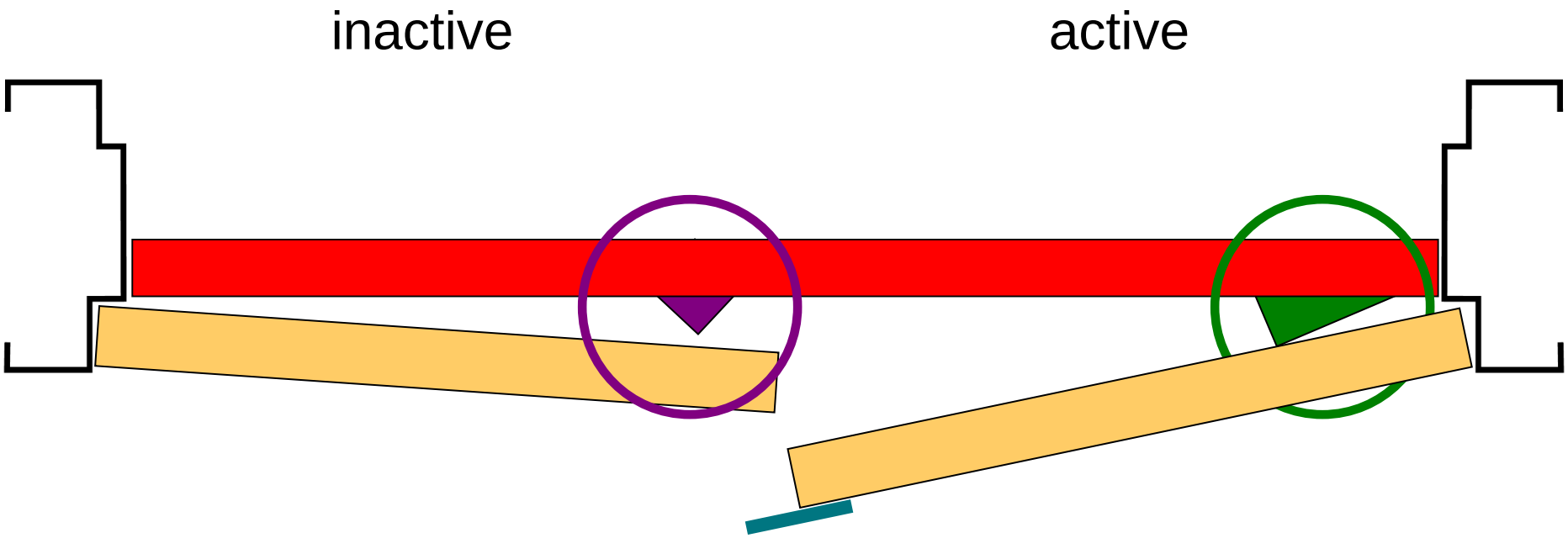

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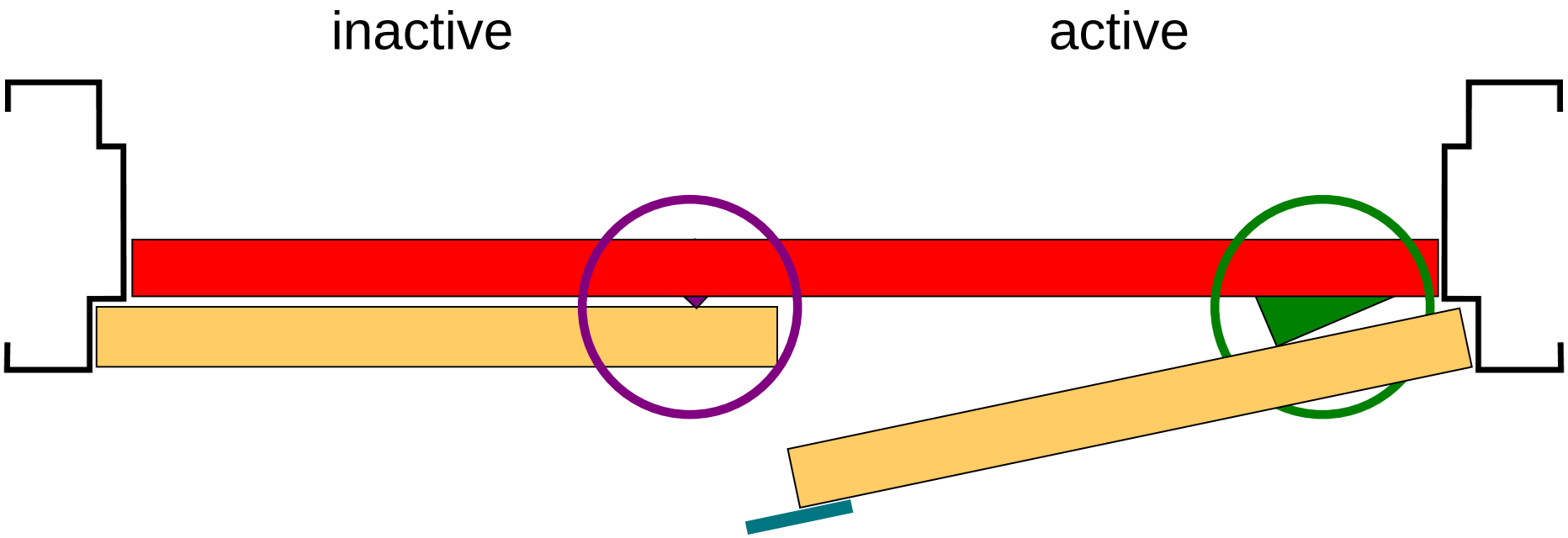

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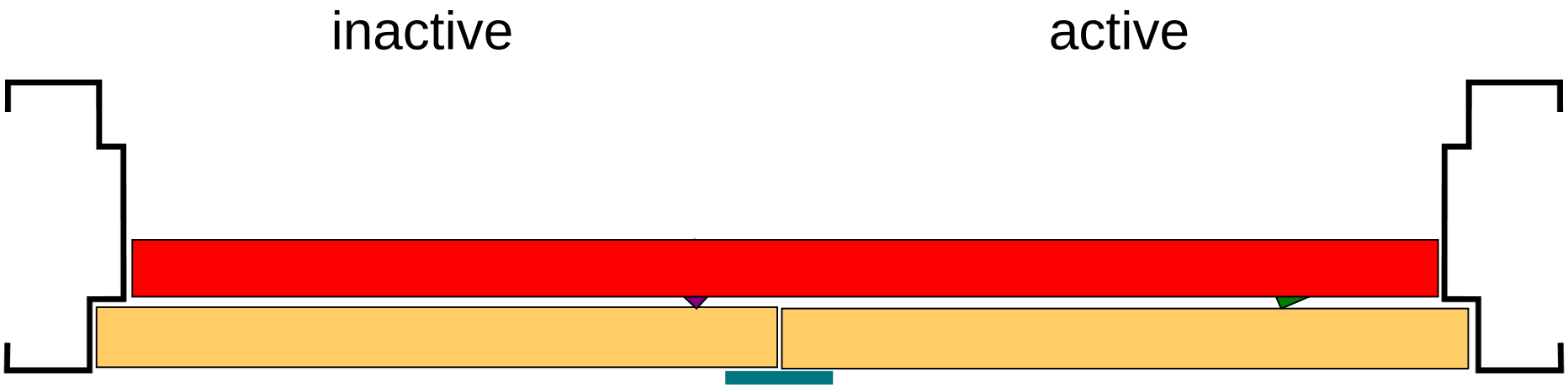

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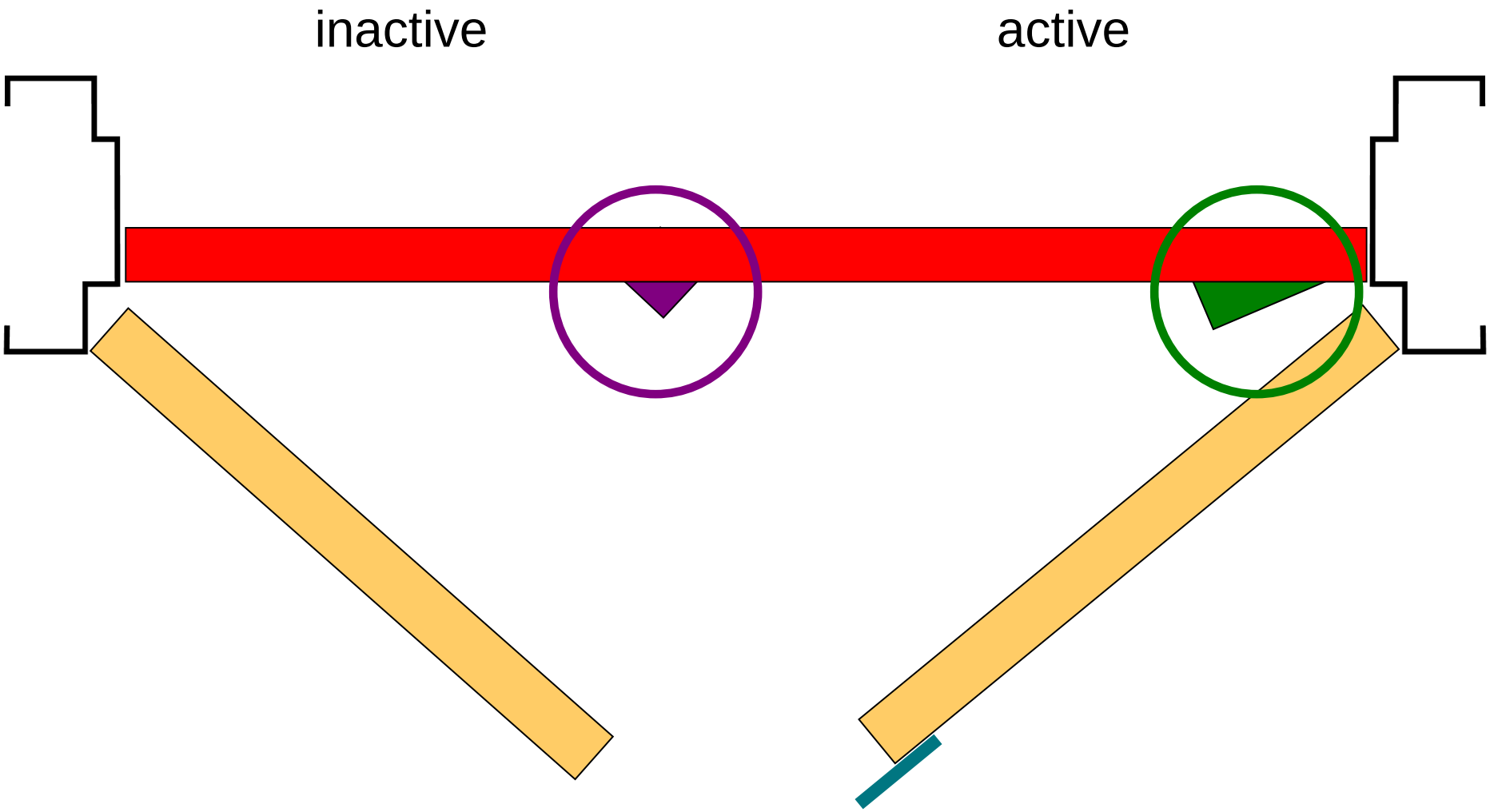

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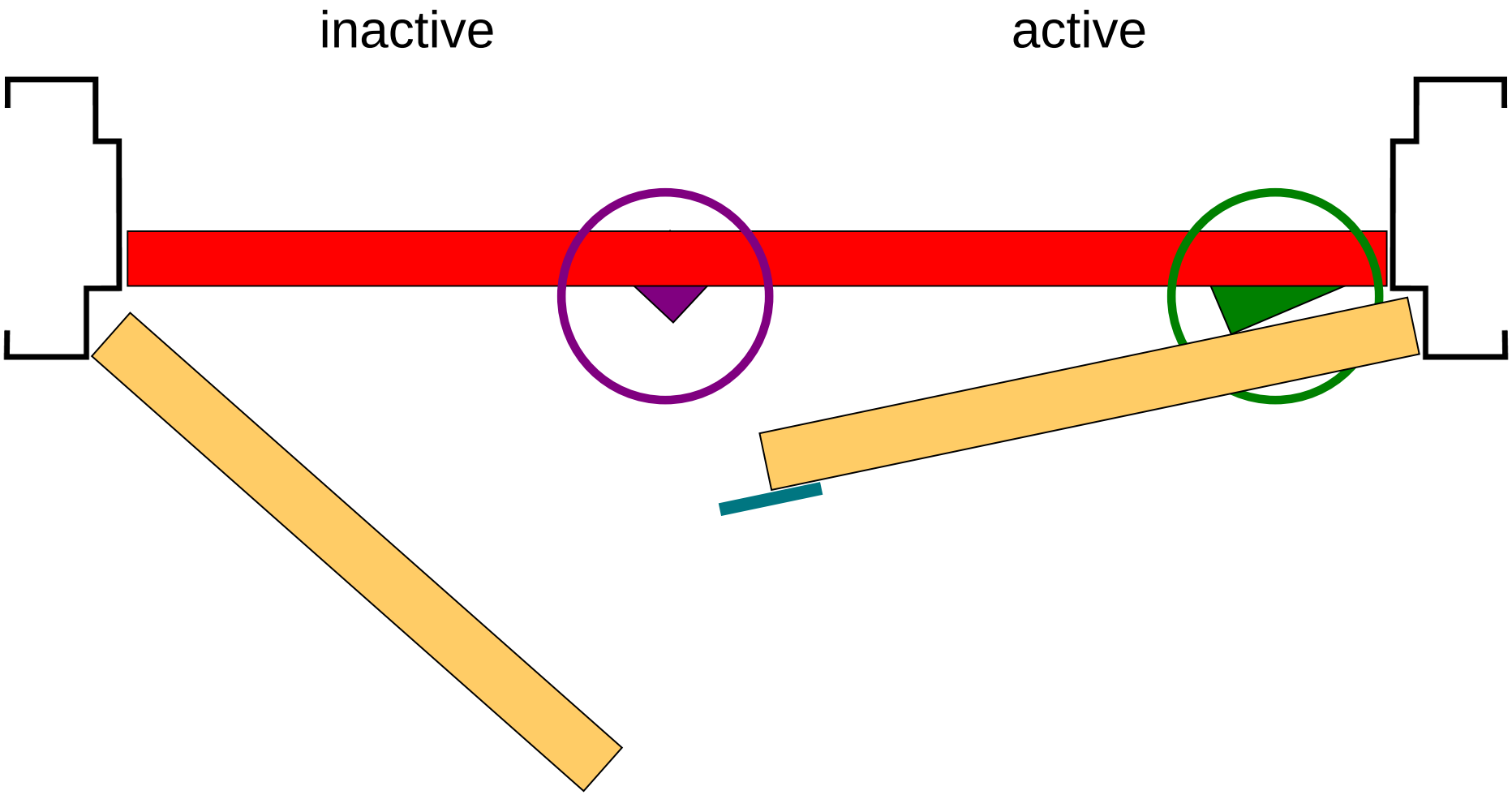

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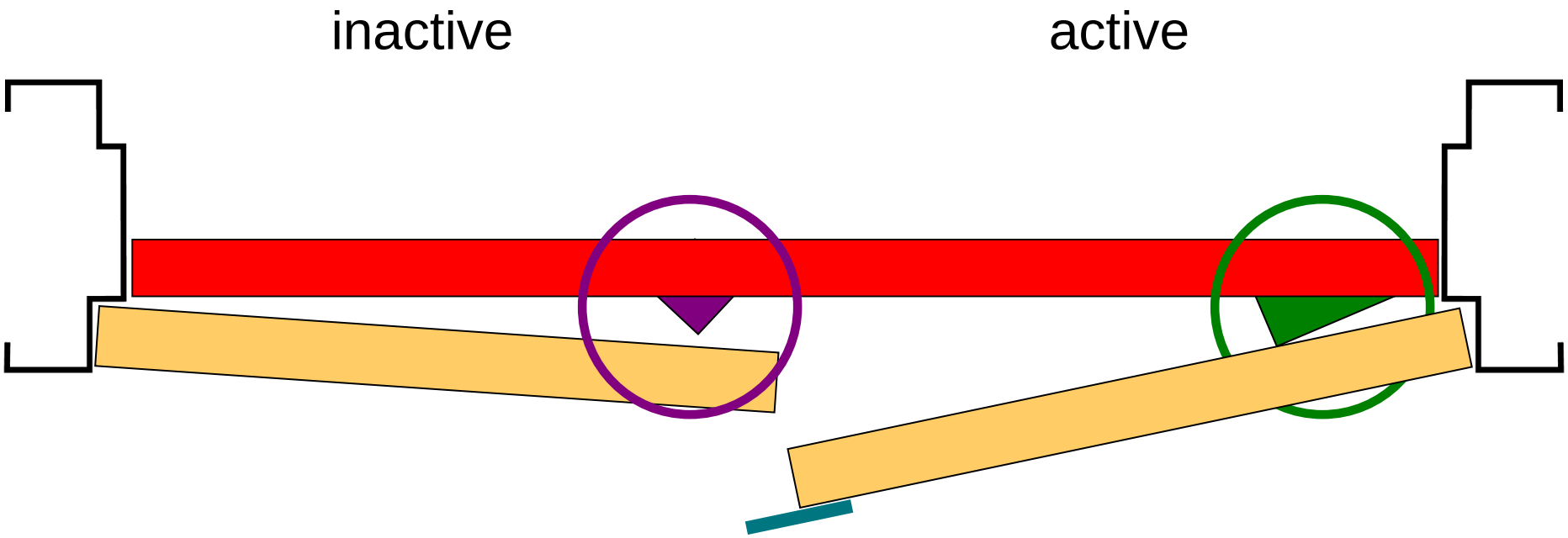

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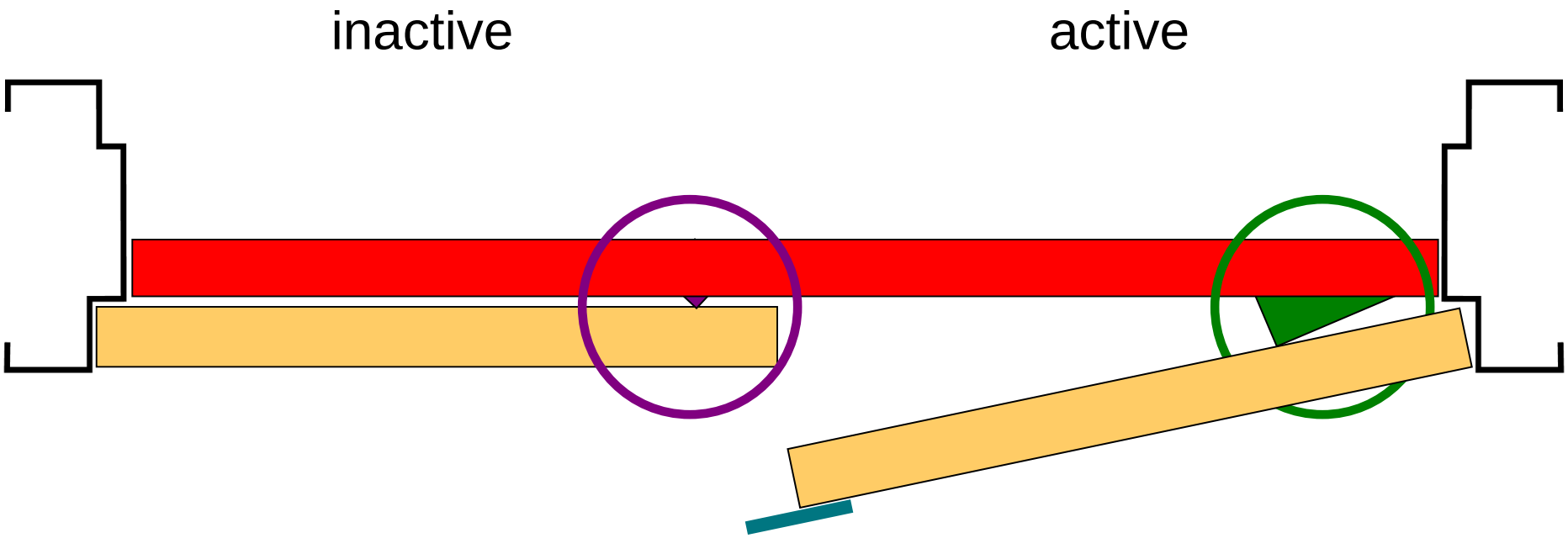

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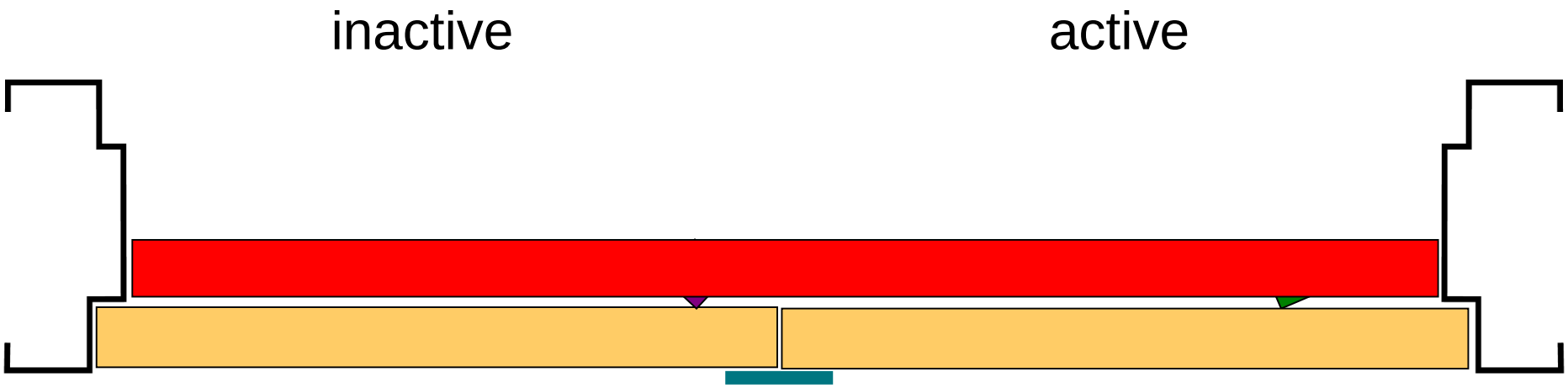


Uncoordinated

Astragals

NFPA 80 – 2007/10/13:

6.4.7* Astragals.

6.4.7.1 *Doors swinging in pairs, where located within a means of egress, shall not be equipped with astragals that inhibit the free use of either leaf.*

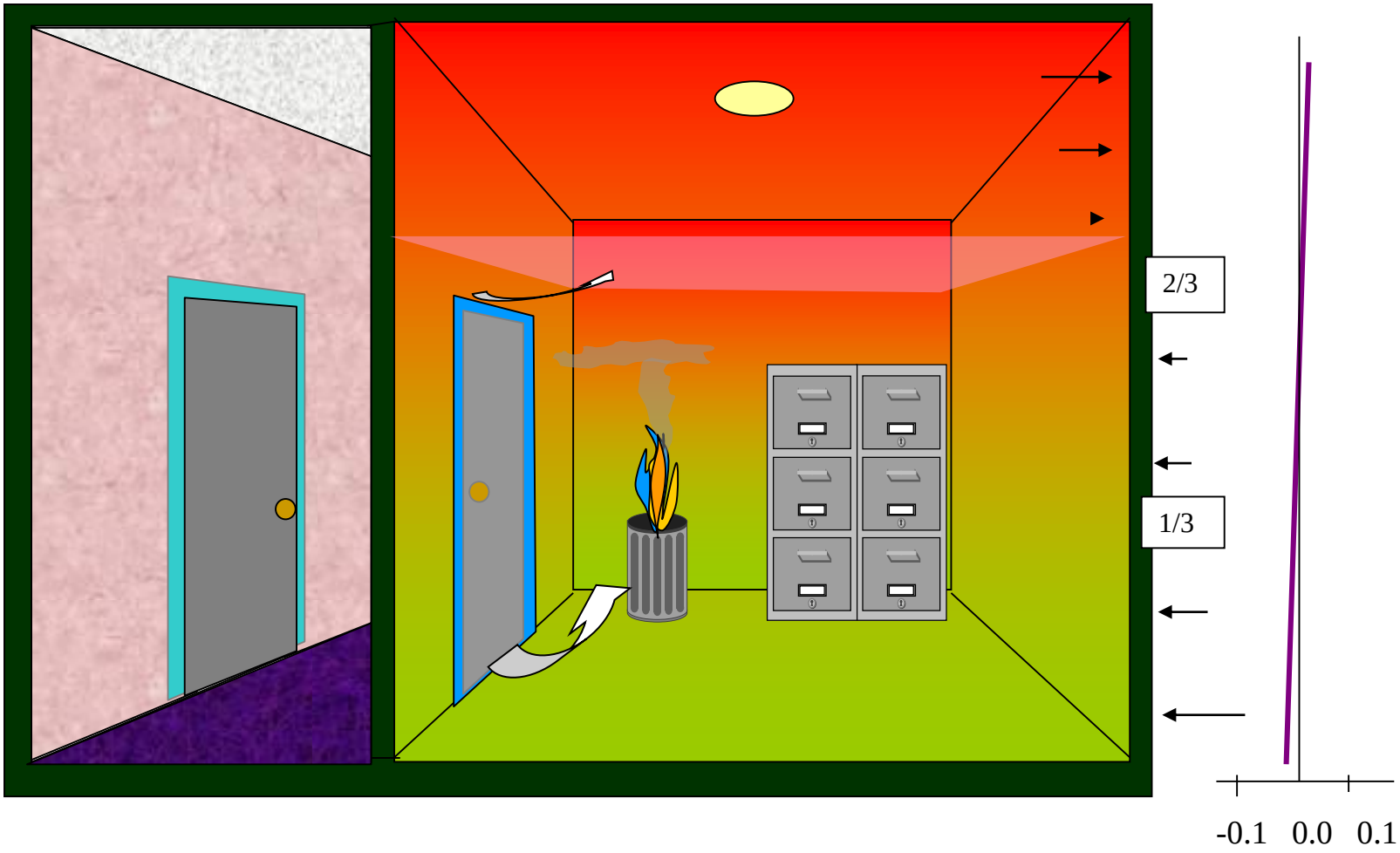
6.4.7.2* *Pairs of doors that require astragals shall have at least one attached in place to project approximately 3⁄4 in. (19 mm) or as otherwise indicated in the individual published listings.*

Previous editions of NFPA 80 required astragals for doors rated more than 90 minutes.

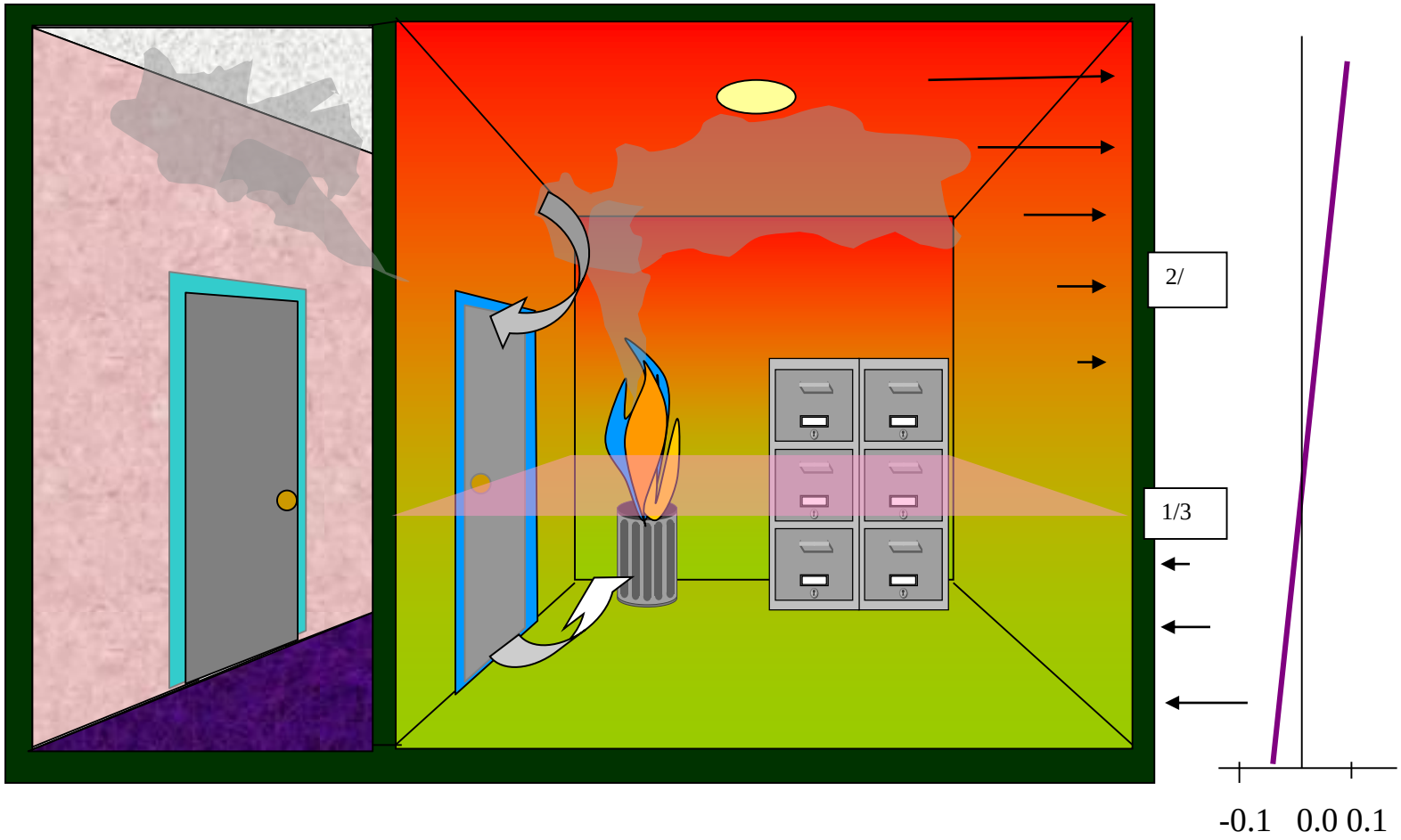
The overlapping astragal on this pair will prevent one door from being opened.

Fire Test Methods

Early Stage



Advanced Stage



In Real Life

- The level of thermal discontinuity can be clearly seen here.
- The neutral pressure plane would be just above that level.

Fire Test Methods

- UL 10B – Neutral/Negative Pressure
  - Neutral pressure plane at top of the tested assembly
- UL 10C – Positive Pressure
  - Neutral pressure plane at 40” above the floor
- NFPA 252 - Flexible - May be conducted using positive pressure (at 40” above the floor), or neutral pressure (@ top of door)

- Category A Doors – intumescent, if required, is part of door
- Category B Doors – intumescent, if required, is field-applied

Fire Test Methods

IBC: ***Side-hinged or pivoted swinging doors.*** *Fire door assemblies with side-hinged and pivoted swinging doors shall be tested in accordance with NFPA 252 or UL 10C.*

After 5 minutes into the NFPA 252 test, the neutral pressure level in the furnace shall be established at 40 inches (1016 mm) or less above the sill.

NFPA 101 currently allows either method of fire testing.

Gasketing

- Some fire doors and smoke doors must be tested in accordance with UL1784 for air infiltration
- The maximum air leakage rate of the door assembly shall be 3.0 $ft^3/min/ft^2$ of door opening...
- Gasketing is typically required to limit air infiltration to this maximum.
- Gasketing must be listed for use on fire doors.
- A bottom seal is not required for fire doors in most locations.

Other Fire Door Basics…

- Job-Site Preparations

Acceptable Job Site Preparations

- Function holes for mortise locks
- Holes for labeled viewers
- ¾” undercutting on wood and composite doors
- Surface-applied hardware
  - Drilling round holes up to 1” maximum diameter
  - Fasteners
  - Cylinders (may be larger than 1” diameter)

When material is removed, holes must be filled with steel fasteners, or the same material as the door or frame.

Field Modifications

- For alterations beyond what is allowed as a job-site preparation:
  - Contact the listing laboratory through the manufacturer.
  - Provide written and/or graphic description of modifications.
  - Laboratory may approve field modifications (in writing) with no field visit / re-labeling required.
  - If the manufacturer is no longer available, the lab may provide an engineering evaluation.

Glazing – NFPA 80

4.4.5* Glazing material shall be permitted in fire doors having the fire protection ratings shown in Table 4.4.5 when tested in accordance with NFPA 252, *Standard Methods of Fire Tests of Door Assemblies*, and shall be limited in size and area in accordance with Table 4.4.5.

Table 4.4.5 Fire Door Rating

Fire Door Rating (hr)	Maximum Area of Glazing (per Door Leaf[a])
½, ⅓	Limited to maximum area tested
¾	Limited to maximum area tested[b]
1[c], 1½ [a,c]	Limited to maximum area tested
3[a]	100 in.^{2} (0.065 m^2)

[a]See also requirements in 4.4.4.

[b]See 4.4.5.1.

[c]Fire protection–rated glazing materials exceeding 100 in.^{2} (0.065 m^2) in area are not permitted in temperature rise–rated doors.

Glazing – NFPA 80

4.4.5.1 Maximum area of individual exposed lights shall be 1296 in.^{2} (0.84 m^2) with no dimension exceeding 54 in. (1.37 m) unless otherwise tested.

4.4.6 Each individual glazing unit shall be identified with a label that is visible after installation.

Glass in all doors must now be impact-resistant – no exception for fire doors.

Fire Resistance Rating vs. Fire Protection Rating

- Fire Resistance Rating – Tested per *ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials*.

- Fire Protection Rating – Tested per NFPA 252 – *Standard Methods of Fire Tests of Door Assemblies,* or NFPA 257 – *Standard on Fire Test for Window and Glass Block Assemblies*.

Example from the IBC (2015):

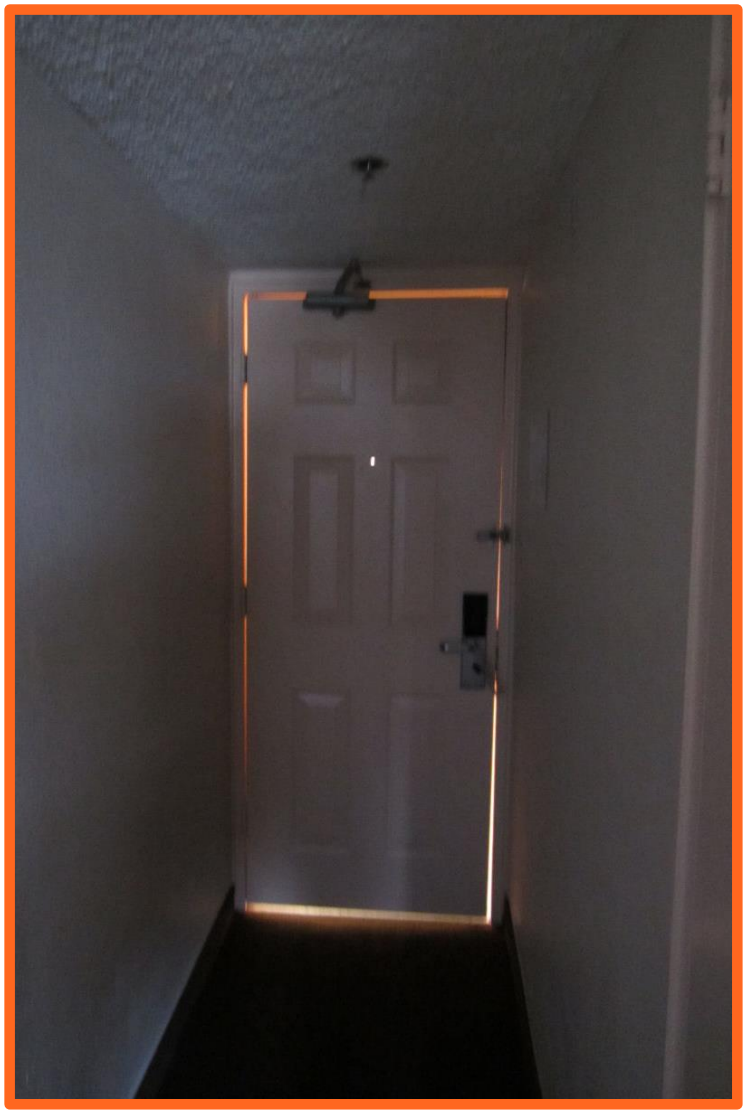
707.6 Openings. Openings in a fire barrier shall be protected in accordance with Section 716. Openings shall be limited to a maximum aggregate width of 25 percent of the length of the wall, and the maximum area of any single opening shall not exceed 156 square feet (15 m2)…

Exceptions:

3. Openings shall not be limited to 156 square feet (15 m2) or an aggregate width of 25 percent of the length of the wall where the opening protective has been tested in accordance with ASTM E 119 or UL 263 and has a minimum fire-resistance rating not less than the fire-resistance rating of the wall.

Clearance

- Bottom of Door
  - 3/4” max under the door
  - 3/8” max if bottom of door is more than 38” AFF
- Jambs, Head, and Meeting Stiles
  - Hollow Metal Doors – 1/8” +/- 1/16”
  - Wood Doors – 1/8”




Patent #D469,704
4
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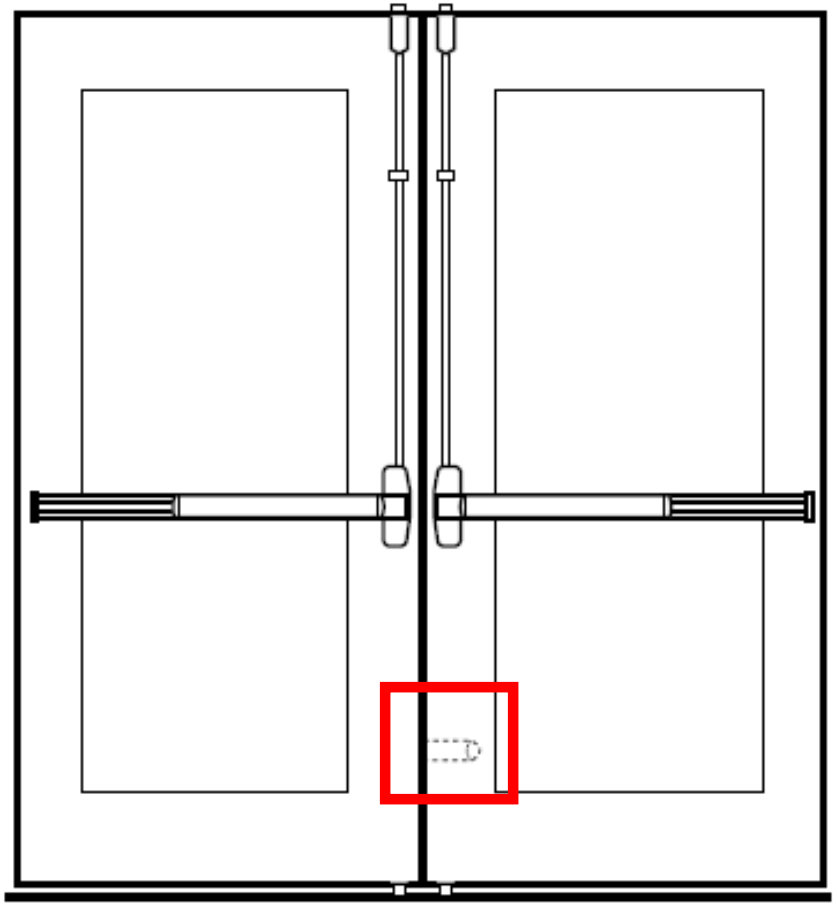
Panic hardware for fire doors is Fire Exit Hardware

- Label: “Fire door to be equipped with fire exit hardware.”
- No mechanical dogging
- Less bottom rod applications
  - “Fire pins” are used to fix door panels in the closed position.
  - Hardware is not required to be operable after fire

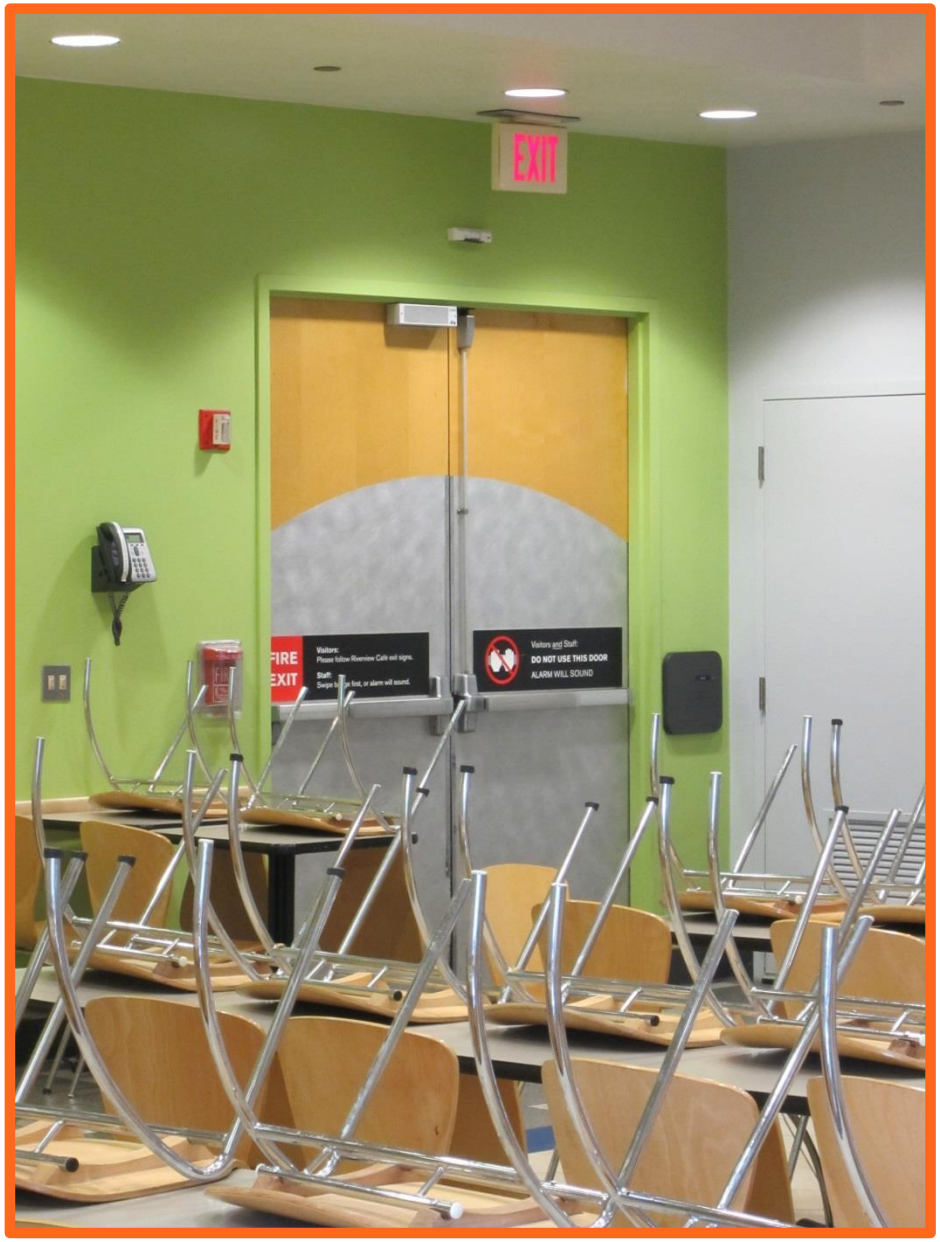


Oops.


EXIT

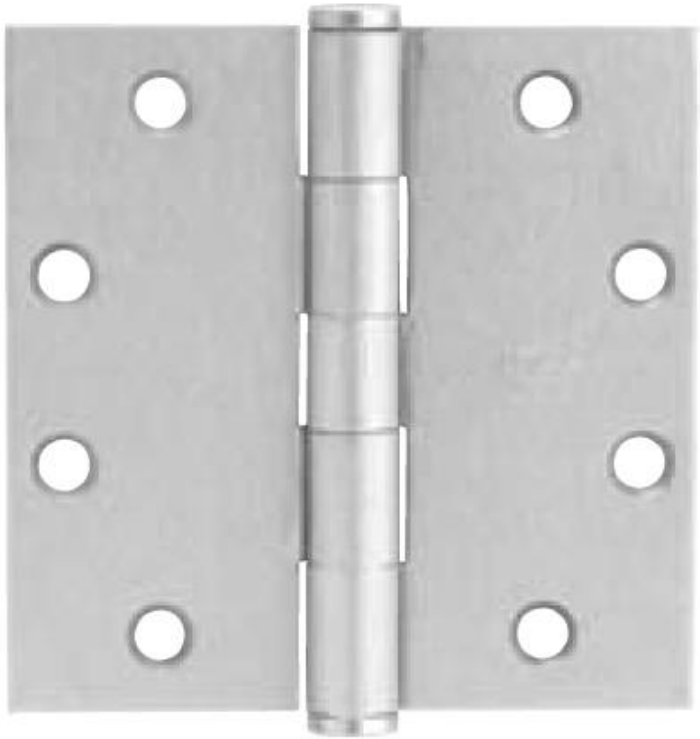
Protection Plates

- 16” maximum above the bottom of the door
- Or UL listed
- Or installed “under label service”



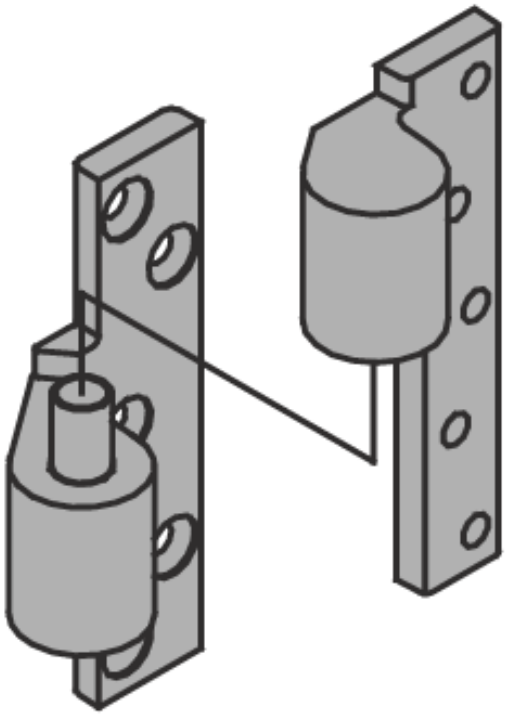
Hinges for Fire Doors

- Steel base material and ball bearing, or as tested
- Proper size, weight, and quantity
- 2 hinges for 60” in height, 1 additional hinge for each additional 30” (or portion)
- Spring hinges are limited to 3070 doors or as tested
- Continuous hinge – length within 1” of door height (2013)



Pivots – New in the 2013 edition of NFPA 80

- If top & bottom pivots are used:
  - Door up to 90 inches in height – 1 intermediate pivot
  - Door more than 90 inches in height – 1 additional intermediate pivot for each additional 30 inches of door height, or fraction thereof
- If only intermediate pivots are used:
  - 2 intermediate pivots for door leaves up to 60 inches in height
  - 1 additional intermediate pivot for each 30 inches of door height or fraction thereof



Hinge Fasteners

NFPA 80 – 2007/10/13:

6.4.3.2.3 *Mortise hinges shall be secured to wood and plastic-covered composite doors or wood core doors with No. 12 × 1¼ in. (31.75 mm) flat, threaded-to-the-head, steel wood screws. Pilot holes shall be drilled that are 5⁄32 in. (4 mm) in diameter.*

6.4.3.2.4 *Surface hinges shall be attached with steel throughbolts.*

6.4.3.4 Shimming. *When required to meet the clearances stated in 6.3.1.7, the shimming of hinges using steel shims shall be permitted.*

Not OK

Signage

NFPA 80 – 2007/10/13:

4.1.4 Signage. *Informational signs shall be permitted to be installed on the surfaces of fire doors in accordance with 4.1.4.1 through 4.1.4.4 or in accordance with the manufacturer's published listing.*

4.1.4.1 *The total area of all attached signs shall not exceed 5 percent of the area of the face of the fire door to which they are attached.*

Signage

NFPA 80 – 2007/10/13:

4.1.4.2 Means of Attachment.

4.1.4.2.1 *Signs shall be attached to fire doors by use of an adhesive.*

4.1.4.2.2 *Mechanical attachments such as screws or nails shall not be permitted.*

4.1.4.3 *Signs shall not be installed on glazing material in fire doors.*

4.1.4.4 *Signs shall not be installed on the surface of fire doors so as to impair or otherwise interfere with the proper operation of the fire door.*

Screws are not allowed for signage on a fire door.

Fire Door Assembly Inspection

- Added to NFPA 80 in 2007
- Responsibility of building owner/property manager
- Documents the condition of the fire door assemblies

- Fire doors have always been required to be kept in code-compliant condition.

NFPA 80 Chapter 5

- Visual inspection – both sides of door
- Functional testing of fire door assemblies
- Ensure door leaves will be closed and latched under fire conditions.
- Performed by individuals with knowledge and understanding of the operating components of the type of door being subject to testing (qualified person).
- Inspection includes operational test of automatic-closing doors .
- 11 inspection criteria in 2007 and 2010 editions, 13 in 2013 edition.
- Deficiencies must be repaired “without delay.”
- 2013 edition requires inspection after installation and maintenance as well as annually.

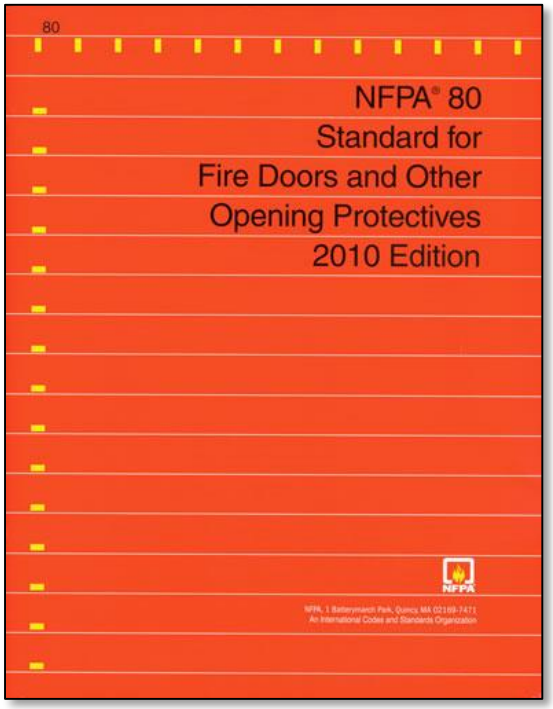
Qualified Person – New in 2010 NFPA 80

***3.3.95 Qualified Person**. A person who, by possession of a recognized degree, certificate, professional standing, or skill, and who, by knowledge, training, and experience, has demonstrated the ability to deal with the subject matter, the work, or the project.*

FDAI Criteria

- Label visible and legible
- No open holes or breaks in door or frame
- Glazing, lite kits, glazing beads securely fastened
- Door, frame, hinges, hardware, threshold, secure, aligned, in working order, no damage
- No missing or broken parts
- Clearances within acceptable limits
- Closer functional, door closes completely
- Coordinator (if installed) works properly
- Latching hardware operates and secures door in closed position
- No auxiliary items that inhibit proper operation
- No field modifications outside of what is allowed by NFPA 80
- Perimeter and meeting stile gasket present if required
- Signage meets requirements of NFPA 80

Session 2 – Fire Doors



- NFPA 80 – format and organization
  - * asterisk, | vertical line, Chapter 6
- Purpose of fire doors
  - compartmentalization to protect egress
- Fire ratings and testing
  - neutral vs. positive pressure
- Basic fire door requirements
  - closing, latching, hinges, plates, glass, gasketing, clearances, job-site preparation
- Fire Door Assembly Inspection

Homework

Watch the video analysis of 30 Dowling Circle fire.

- Apartment building
- Doors equipped with spring hinges
- Carpet and door sweep prevented doors from closing
- 1 Firefighter fatality

Questions?

www.iDigHardware.com/decoded-dhi

THANKS FOR ATTENDING!

- Recording and handouts will be available by the end of the week at DHInteractive
- Upcoming Webinars by Lori!
- **Egress and Life Safety** (1/21/15) 11:00 am ET
- **Codes for Electrified Hardware** (2/18/15) 11:00 am ET
- You must sign-up for each session individually

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14150 Newbrook Drive, Ste. 200, Chantilly, VA 20151
703.222.2655 | Fax: 703.222.2410
education@dhi.org | www.dhi.org