

Decoded Series

- Class 1 – Introduction to Codes + Accessibility Requirements
- **Class 2 – Fire Door Assemblies**
- Class 3 – Egress and Life Safety
- Class 4 – Codes for Electrified Hardware

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DAHC/CDC, CCPR, FDHI, FDAI
Allegion, Manager – Codes & Resources

Decoded 2 – Swinging Fire Door Assemblies

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Decoded – Fire Door Assemblies

- NFPA 80 – format and organization
- Purpose of fire doors
- Fire ratings and testing
- Basic fire door requirements
- Fire door assembly inspection

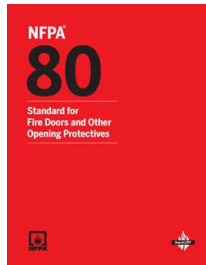


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NFPA 80 – Standard for Fire Doors and Other Opening Protectives

- Details the requirements for fire door assemblies
- Referenced by the IBC, NFPA 101, & other codes
- Does not state where fire doors are required
- Recent Editions: 2007, 2010, 2013, 2016, 2019, 2022



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NFPA 80 Changes and Clarifications

* = More information in Annex A
– Explanatory Material

] = Revised in the last code
change cycle.

2016 and subsequent editions
do not include the vertical line to
signify changes.

Chapter 1 Administration

1.1* Scope. This standard regulates the installation and maintenance of assemblies and devices used to protect openings in walls, doors, 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 business doors for elevators and dumbwaiters.

1.1.4* This standard does not cover fire resistance 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*.

2019 edition Shaded text = Revisions. **Δ** = Text deletions and figure/table revisions. ***** = Section deletions. **N** = New material.

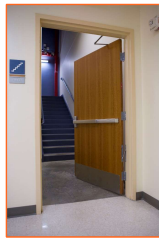
Image: NFPA

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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 – Inspection, Testing, 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



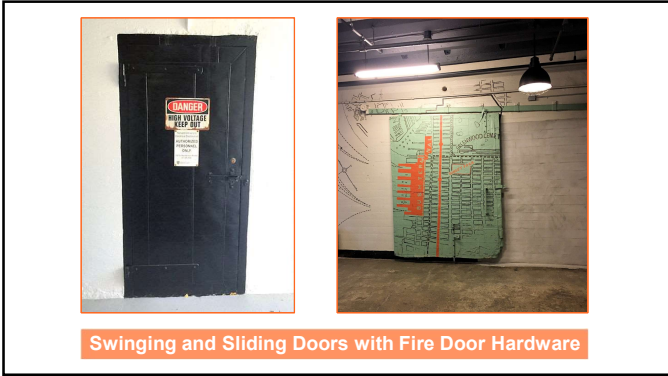
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Swinging Doors
with Builders Hardware

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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

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Fire Door Ratings

Typical Ratings (US)

- A – 3 hours
- B – 90 minutes or 60 minutes
- C – 45 minutes
- 20 minutes

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



Photos courtesy of Fire Protection Specialist Christopher Taylor, NYS Office of Fire Prevention and Control.

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Photos courtesy of Fire Protection Specialist Christopher Taylor, NYS Office of Fire Prevention and Control.

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APR 26 2008



Photos: Jamie 184 via Flickr

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

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Operation of Doors – NFPA 80

Self-Closing Doors. Doors that, when opened and released, return to the closed position.

Automatic-Closing Doors. Doors that are normally open but close 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 the building is not occupied.

Power-Operated Fire Doors. Doors that normally are opened and closed electrically or pneumatically.

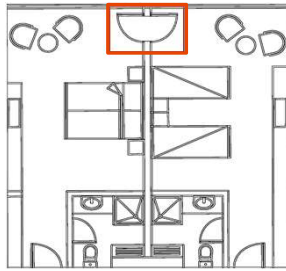
- Must be deactivated upon fire alarm.

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Exception

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

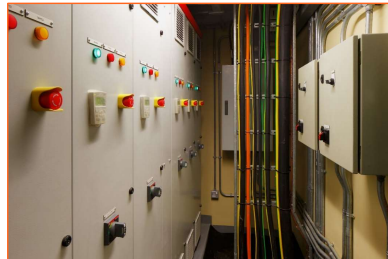


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Exception

- Inactive leaf of rated pair to room not normally occupied by people (where approved by the AHJ):
 - Boiler room
 - Electric room
 - Mechanical room



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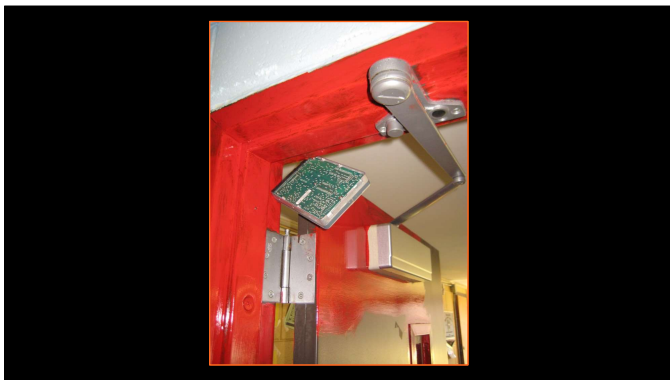
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Acceptable Ways to Hold Open a Fire Door

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



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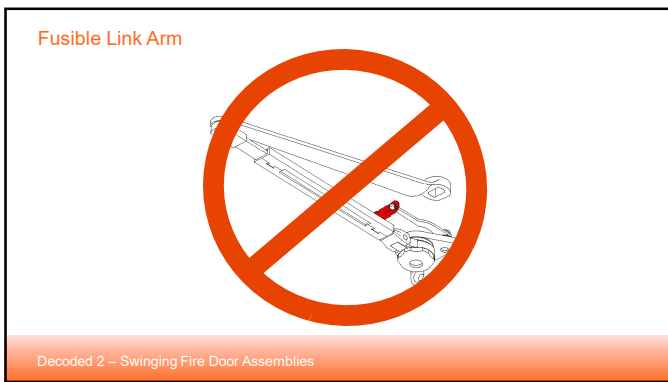
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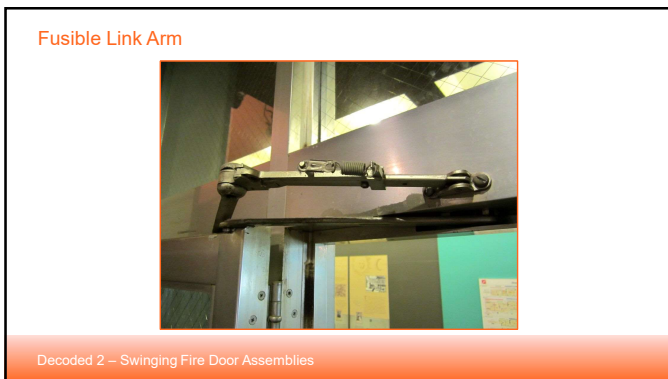
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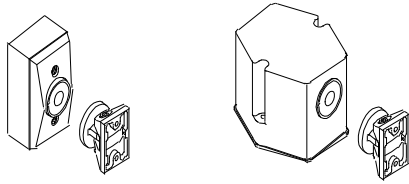
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Acceptable Ways to Hold Open a Fire Door

- Wall or floor magnet with closer



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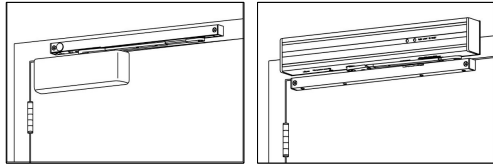
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Acceptable Ways to Hold Open a Fire Door

- Electro-magnetic hold-open closer



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An auxiliary stop MUST be used with electrified closer/holders.



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Acceptable Ways to Hold Open a Fire Door

- Battery-operated detected holder with closer

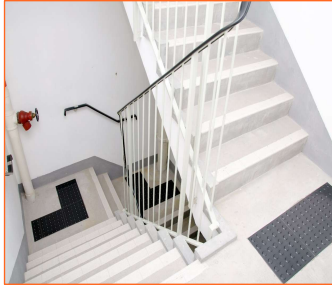


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Stair Enclosures

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



Excerpt: NFPA 101

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Self Latching Positive Latching

- Must have an active latch bolt



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Latch Throw



NFPA 80 – 2007 and subsequent editions:
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.

Excerpt: NFPA 80

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Self Latching
Positive Latching

- No Mechanical Dogging



Latch may be held back using electric latch retraction but must release upon fire alarm activation.

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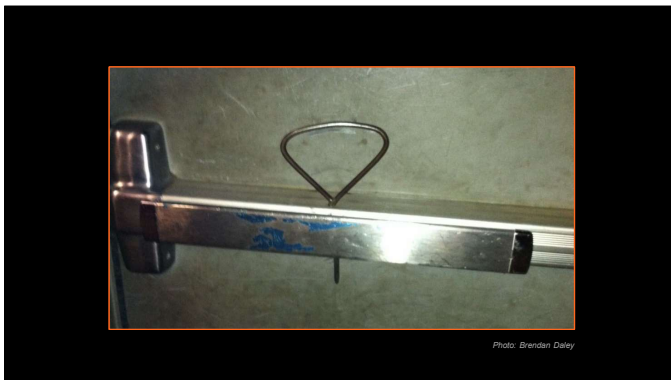
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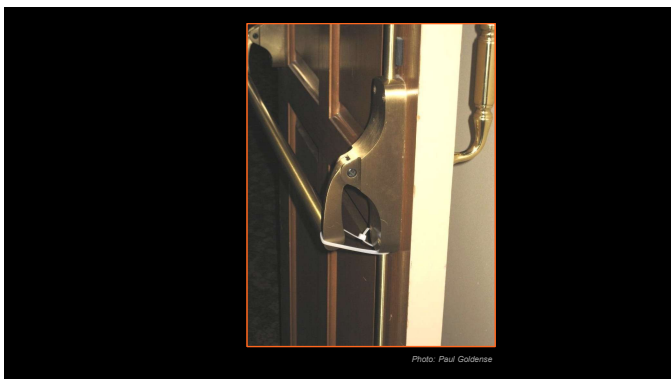
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**Self Latching
Positive Latching**

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



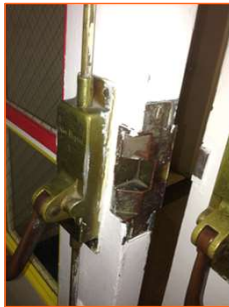
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Open Back Strikes

NFPA 80 – 2010 and subsequent editions:

6.4.4.10* Open back strikes ...permitted to be used in lieu of conventional strikes only where specifically provided for in the published listings.



Excerpt: NFPA 80

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**Self Latching
Positive Latching**

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



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Flush Bolts



manual



automatic

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Door Coordinators

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



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Astragals

NFPA 80 – 2010 and subsequent editions

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.

Except: NFPA 80

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Fire Test Methods



Photo: Leslie Miller, Fire Protection Publications

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Fire Test Methods

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



Photo: Leslie Miller, Fire Protection Publications

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Fire Test Methods

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



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Fire Test Methods

2018 IBC and subsequent editions:

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. For tests conducted in accordance with NFPA 252, the fire test shall be conducted using the positive pressure method specified in the standard.

Previous editions:

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 or less above the sill.

NFPA 101 currently allows either method of fire testing.

Excerpt: IBC

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Gasketing

- Some fire doors & smoke doors must be tested in accordance w/UL1784 for air infiltration
- Maximum air leakage rate of the door assembly shall be 3.0 ft³/min/ft² of door opening
- Gasketing 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.



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Other Fire Door Basics...

- Job Site Preparations
 - Function holes for mortise locks
 - Holes for labeled viewers
 - 3/4-inch undercutting on wood and composite doors
- Surface-applied hardware
 - Drilling round holes
 - Fasteners
 - Cylinders



Photos: Jimmy Resedean Jr.

This field prep would not be code-compliant on a fire door.

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When material is removed, holes must be filled with steel fasteners, or the same material as the door or frame, or a product that is listed for this purpose.



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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.

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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, ¾	Limited to maximum area tested
¾	Limited to maximum area tested ^b
1 ^c , 1½ ^{ac}	Limited to maximum area tested
3 ^a	100 in. ² (0.065 m ²)

^aSee also requirements in 4.4.4.

^bSee 4.4.5.1.

^cFire protection-rated glazing materials exceeding 100 in.² (0.065 m²) in area are not permitted in temperature rise-rated doors.

Excerpt: NFPA 80

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Glazing – NFPA 80

Photo: Anemostat
Excerpt: NFPA 80

4.4.5.1 Maximum area of individual exposed lights shall be 1296 square inches with no dimension exceeding 54 inches 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.



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Fire Protection Rated vs. Fire Resistance Rated

Fire Protection Rated – 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.

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



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Example from the IBC:

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

Exceptions:

3. Openings shall not be limited to 156 square feet 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.

Excerpt: IBC

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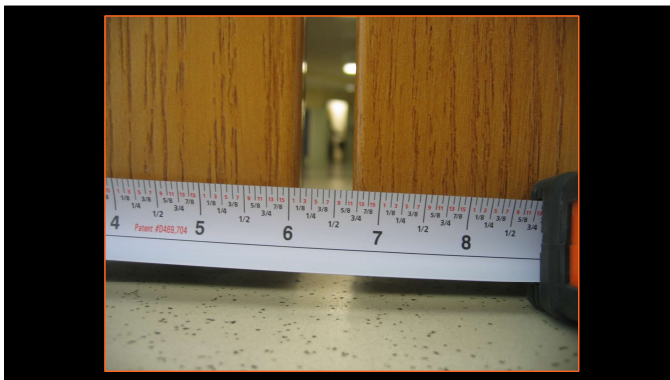
Clearance

- Bottom of Door
 - 3/4-inch maximum under the door
 - 3/8-inch maximum if bottom of door is more than 38 inches AFF
- Head, Jambs, and Meeting Stiles
 - Hollow Metal Doors – 1/8-inch +/- 1/16-inch
 - Wood Doors – 1/8-inch
 - 2016 and subsequent editions - 20-minute doors (including wood doors) in hollow-metal frames – 1/8-inch +/- 1/16-inch



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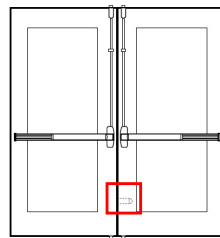
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Panic hardware for fire doors is Fire Exit Hardware

- Label: "Fire door to be equipped with fire exit hardware"
- No mechanical dogging
- Less bottom rod applications (LBR)
 - Auxiliary fire pins are used to keep doors aligned during a fire.
 - Hardware is not required to be operable after a fire.



Decoded 2 – Swinging Fire Door Assemblies

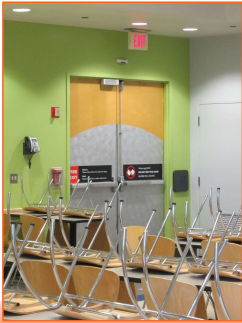
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Protection Plates

- Must be labeled for use on a fire door.
- Exceptions:
 - Plates installed not more than 16 inches above the bottom of the door
 - Plates installed "under label service" (prior to 2016 edition of NFPA 80)

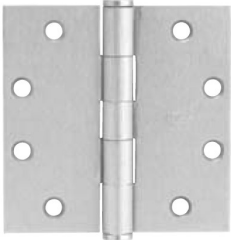


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Hinges for Fire Doors

- Steel base material and ball bearing, or as tested
- Proper size, weight, & quantity
- 2 hinges for 60 inches in height, 1 additional hinge for each additional 30 inches (or portion)
- Spring hinges are limited to 3070 doors or as tested
- Continuous hinge – length within 1 inch of the door height (80-2013)

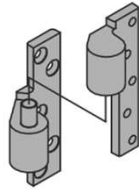


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Pivots – Added in the 2013 edition of NFPA 80

- 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



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Hinge Fasteners

NFPA 80 – 2010 and subsequent editions:

6.4.3.2.3 *Mortise hinges shall be secured to wood and plastic-covered composite doors or wood core doors with No. 12 x 1/4 in. flat, threaded-to-the-head, steel wood screws. Pilot holes shall be drilled that are 5/32 in. 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.*

Excerpt: NFPA 80

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Signage

NFPA 80 – 2010 thru 2019:

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.*

Excerpt: NFPA 80

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Signage

NFPA 80 – 2010 thru 2019:

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.

Excerpt: NFPA 80

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Signage – 2022 edition of NFPA 80

Excerpt: NFPA 80

4.1.3.1 Allowable Area.

The total area of all attached signs shall comply with the following:

- (1) Signage comprising combustible materials shall not exceed 5 percent of the area of the face of the fire door.
- (2) Signage that is painted on with stencils or other similar methods shall not be limited in area.
- (3) Vinyl signage up to 0.008 in. (0.2 mm) in thickness shall not exceed 5 percent of the area of the face of the fire door.
- (4) Metal signage up to 20 gauge thickness shall not exceed 200 in.² (0.13 m²).

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Until the 2022 edition of NFPA 80, screws were not allowed for signage on a fire door.

- Signs must be installed with adhesive, OR
- The 2022 edition allows:
 - Up to four steel or stainless steel sheet metal screws up to U.S. size #8 (4.2 mm) or up to four other steel fasteners not exceeding 0.17 in. (4.2 mm) shall be permitted to penetrate one side of a fire door to attach metal signs.



Image: Brendan Dalry

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Fire Door Assembly Inspection

- 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



Image: Door & Hardware Institute

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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



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NFPA 80 Chapter 5

- 11 inspection criteria in 2007 & 2010 13 in 2013 and subsequent editions
- Inspection completed by a "Qualified Person" 2010 edition
- Deficiencies must be repaired "without delay"
- 2013 edition & beyond requires inspection after installation & maintenance as well as annually



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FDAI Criteria (Part 1 of 2)

- Labels visible & legible
- No open holes/breaks in door or frame
- Glazing, light 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

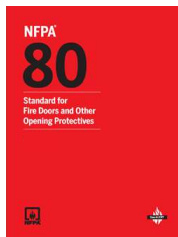


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FDAI Criteria (Part 2 of 2)

- 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



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Decoded 2 – Fire Door Assemblies

- NFPA 80 – format and organization
 - * asterisk, | vertical line, or shading
 - 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, alterations
- Fire Door Assembly Inspection



Decoded 2 – Swinging Fire Door Assemblies

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