

Fire-Resistance-Rated Glazing for New and Existing Buildings

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Key Purposes of Fire-rated Glazing

- Allows visibility into a space
- Prevents spread of fire and smoke (compartmentation)



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Uses of Fire-rated Glazing

- As a fire-resistance-rated wall assembly
- Vision panels in fire rated door assemblies
- Transom and sidelight panels used adjacent to fire doors
- Fire window assemblies

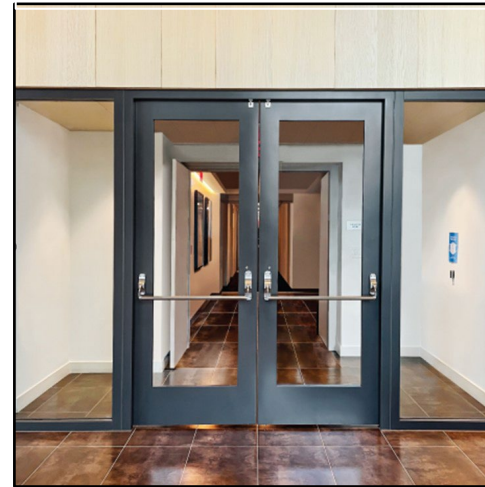
Fire-resistance-rated Wall



Vision Panel in Door



Sidelight Panels



Interior Fire Windows



What Type of Glazing is Required?

- The type of glazing required for each of these applications is based on the following:
 - Type of barrier
 - Rating of barrier
 - Application of the glazing panel (door, sidelight, transom, window)
 - Size of glazing panel
- The type of glazing required is found in the International Building Code and the Life Safety Code

Key Attributes for Fire and Human Impact Safety

- **Fire Test** – Measures the amount of time, in minutes or hours, that fire-rated glazing and framing can withstand fire exposure in a furnace
- **Hose Stream Test** – Heated glass and frames are subjected to water from a hose stream. The cooling, impact and erosion created by the hose stream evaluates the structural integrity of the glazing and frame

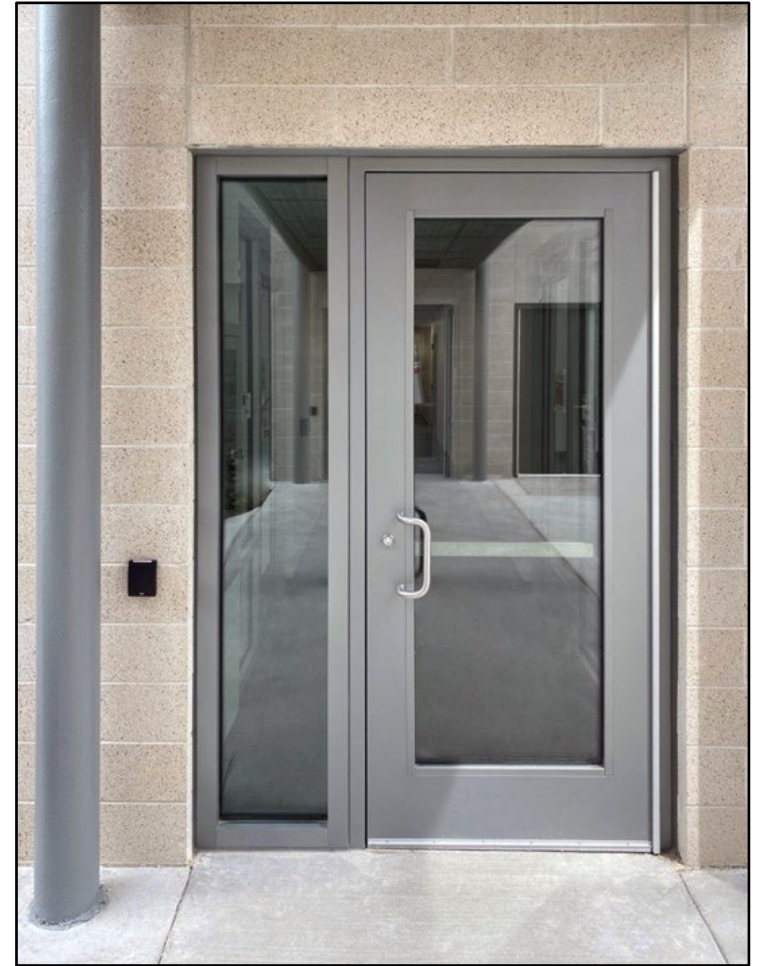
Key Attributes for Fire and Human Impact Safety Cont.

- **Impact Safety Test** – Measures the ability of glass to withstand impact. Ratings are given in levels based on the amount of force the glass can resist. Typically defined by CPSC Category I or II rating.
 - Glazing in human impact zones required to meet a Category II rating



Types of Fire-rated Glazing

- Fire-rated glazing
 - **Fire-resistance-rated glazing**
 - Fire-resistance-rated glazing used in walls
 - Fire-resistance-rated glazing used in fire door applications including transoms and sidelights

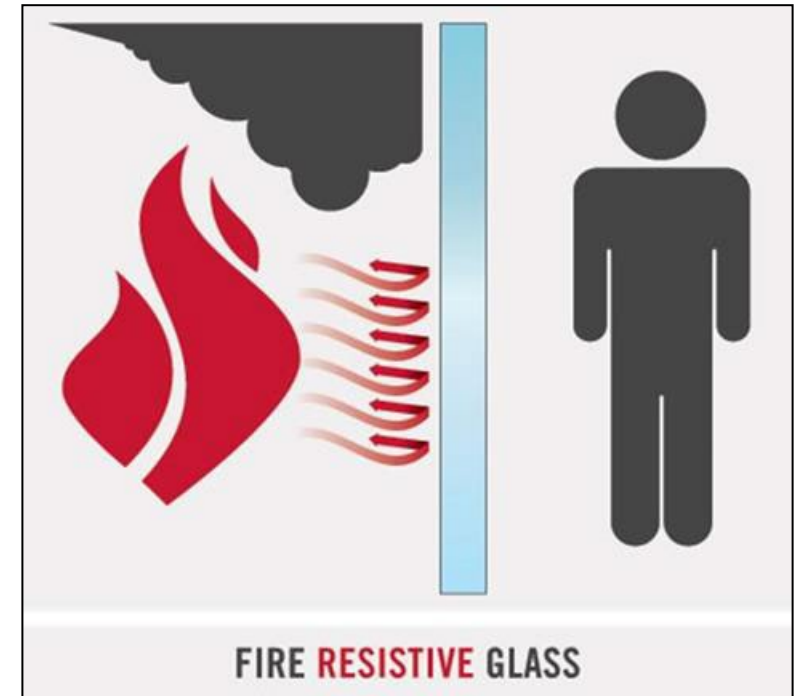


Types of Fire-rated Glazing

- Fire-rated glazing
 - Fire-protection-rated glazing
 - Fire-protection-rated glazing used in walls
 - Fire-protection-rated meeting hose stream requirements
 - Fire-protection-rated glazing used in fire door applications including transoms and sidelights
 - Fire-protection-rated glazing w/o hose stream
 - Fire-protection-rated meeting hose stream requirements
 - Fire-protection-rated meeting hose steam and temperature requirement

Fire-resistance-rated Glazing

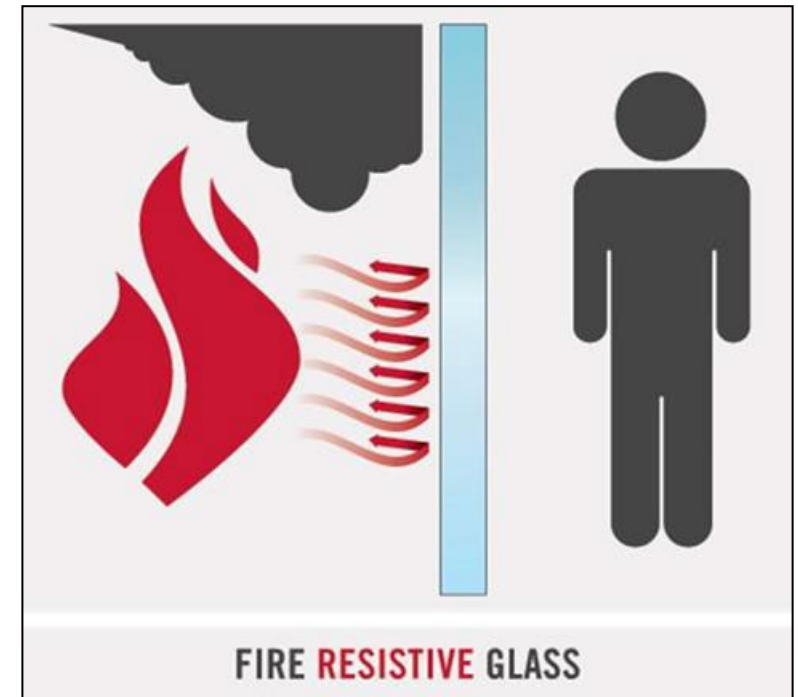
- “Thick” glazing
- Stops fire **AND** passage of heat
- Classified as a “wall” rather than an opening (window)
- Meets same requirements as a gypsum or CMU wall
- When used in walls, both glass and frame must block passage of heat



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Fire-resistance-rated Glazing Cont.

- May be used in floor to ceiling sizes, but may not exceed manufacturers tested size
- When used in doors, must also meet requirements of hose stream after full fire exposure

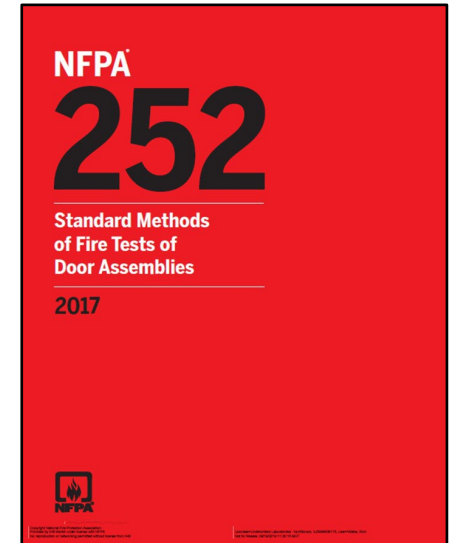


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Standards

Fire-resistance-rated Glazing

- When used as a wall
 - UL 263 / ASTM E119
- When used as vision panel in doors
 - UL 263 / ASTM E119, **and**
 - UL 10B / UL 10C / NFPA 252
- In 2012 and later codes, glazing in excess of 100 sq in. in doors in interior exit stairways, ramps and exit passageways is required to be fire-resistance-rated and shall have a max temperature rise of 450°F for 30 minutes



Conditions of Acceptance

UL 263 / ASTM E119

- Flame Passage
- 250°F / 325°F Temperature Rise
- Hose Stream on Duplicate Test Sample Exposed to Fire for Reduced Time Frame

Conditions of Acceptance

UL 10B / UL 10C / NFPA 252

- Flame Passage
- Hose Stream after Full Duration Fire Exposure
 - Limited Openings (Max 5% Fall-Out) Permitted

Fire-protection-rated Glazing

- Fire-rated, thin glazing
- Traditional fire-rated material (wired glass, proprietary glass, etc.)
 - Traditional wired glass does not meet safety glazing requirements
- Allows significant radiant heat from unexposed side
- May or may not be required to meet hose stream depending on application



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Fire-protection-rated Glazing Cont.

- Used as Opening Protectives
 - Fire Windows: 20 to 90 minutes
 - Fire Doors: 20 minutes to 3 hrs
 - When used in fire windows, may not exceed 25% of the area of a common fire-resistance-rated wall
 - Size shall comply with IBC and NFPA 80, and may not exceed manufacturers tested sizes

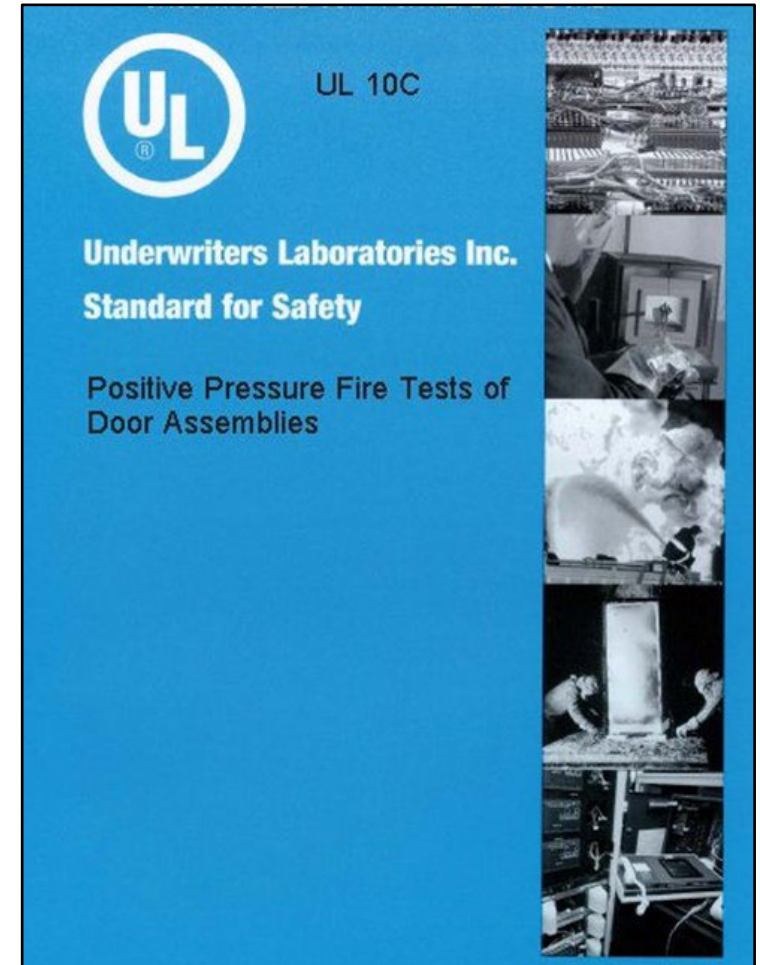


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Standards

Fire-protection-rated Glazing

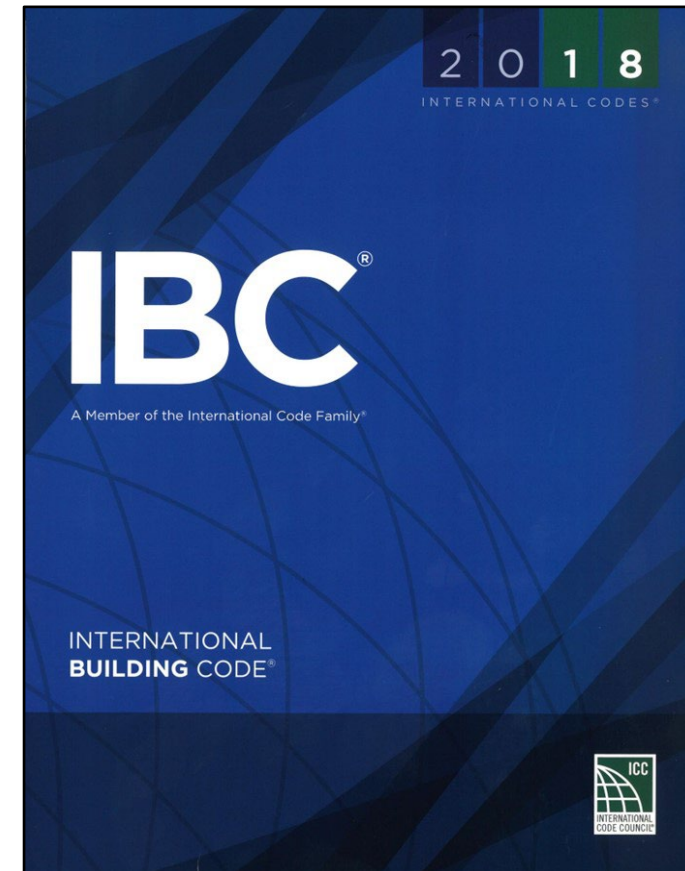
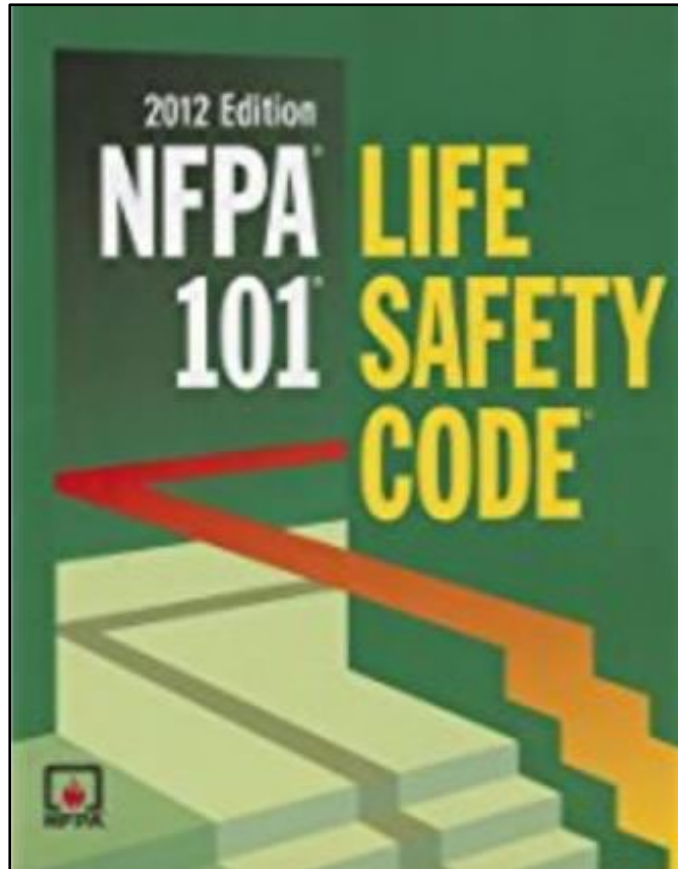
- Glazing used in fire door assemblies
 - UL 10C / NFPA 252 (side hinged or swinging fire door assemblies)
 - UL 10B / NFPA 252 (all other types of fire door assemblies)
- Glazing used in fire window assemblies
 - UL 9 / NFPA 257



Conditions of Acceptance for Fire Doors / Windows UL 10C / UL 10B / NFPA 252 / UL 9 / NFPA 257

- Flame Passage
- Hose Stream after Full Duration Fire Exposure
 - Limited Openings (Max 5% Fall-Out) Permitted
- When used in some 20 min fire door applications, the code waives the requirement for the hose stream test

Code Requirements for Fire-Rated Glazing



Component Approach Used for Fire Door and Fire Window Assemblies

- Both documents prescribe a component approach for fire door and fire window openings
- IBC and NFPA 101 by referencing NFPA 80 require fire door and fire window components to be Listed and Labeled
- Approval of the finished opening protective relies on Listing and ratings of individual components with final decision up to the Code Official

Glazing in Fire Doors

- Section 716.2 of the 2018 IBC
- Table 716.1(2)
 - Establishes requirements for rating on fire doors based on required vertical assembly type and rating
 - Goes on to establish rating and marking requirements for glazing in fire doors

**TABLE 716.1(2)
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 ^b	FIRE-RATED GLAZING MARKING DOOR VISION PANEL ^{c, e}	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	See Note b	D-H-W-240	Not Permitted	4	Not Permitted	W-240
	3	3 ^a	See Note b	D-H-W-180	Not Permitted	3	Not Permitted	W-180
	2	1½	100 sq. in.	≤ 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.	≤ 100 sq. in. = D-H-90 >100 sq. in. = D-H-W-90	Not Permitted	1½	Not Permitted	W-90
Enclosures for shafts, interior exit stairways and interior exit ramps.	2	1½	100 sq. in. ^c	≤ 100 sq. in. = D-H-90 > 100 sq. in. = D-H-T-W-90	Not Permitted	2	Not Permitted	W-120
				≤ 100 sq. in. = D-H-180				
Horizontal exits in fire walls ^d	4	3	100 sq. in.	> 100 sq. in. = D-H-W-240	Not Permitted	4	Not Permitted	W-240
	3	3 ^a	100 sq. in.	≤ 100 sq. in. = D-H-180 > 100 sq. in. = D-H-W-180	Not Permitted	3	Not Permitted	W-180
Fire barriers having a required fire-resistance rating of 1 hour: Enclosures for shafts, exit access stairways, exit access ramps, interior exit stairways and interior exit ramps; and exit passageway walls	1	1	100 sq. in.	≤ 100 sq. in. = D-H-60 >100 sq. in. = D-H-T-W-60	Not Permitted	1	Not Permitted	W-60

Glazing in Fire Windows

- Section 716.3 of the 2018 IBC
- Table 716.1(3) – Establishes requirements for rating on fire window assembly based on required vertical assembly rating

**TABLE 716.1(3)
FIRE WINDOW ASSEMBLY FIRE PROTECTION RATINGS**

TYPE OF WALL ASSEMBLY	REQUIRED WALL ASSEMBLY RATING (hours)	MINIMUM FIRE WINDOW ASSEMBLY RATING (hours)	FIRE-RATED GLAZING MARKING
Interior walls			
Fire walls	All	NP ^a	W-XXX ^b
Fire barriers	>1 1	NP ^a NP ^a	W-XXX ^b W-XXX ^b
Atrium separations (Section 707.3.6), Incidental use areas (Section 707.3.7), Mixed occupancy separations (Section 707.3.9)	1	³ / ₄	OH-45 or W-60
Fire partitions	1 0.5	³ / ₄ ¹ / ₃	OH-45 or W-60 OH-20 or W-30
Smoke barriers	1	³ / ₄	OH-45 or W-60
Exterior walls	>1 1 0.5	1 ¹ / ₂ ³ / ₄ ¹ / ₃	OH-90 or W-XXX ^b OH-45 or W-60 OH-20 or W-30
Party wall	All	NP	Not Applicable

NP = Not Permitted.

a. Not permitted except fire-resistance-rated glazing assemblies tested to ASTM E119 or UL 263, as specified in Section 716.1.2.3.

b. XXX = The fire rating duration period in minutes, which shall be equal to the fire-resistance rating required for the wall assembly.

Fire-resistance-rated Glazing

- Fire-resistance-rated glazing may be utilized where:
 - Required size of glazing exceeds code allowance for fire-protection-rated glazing
 - Based on NFPA 80
 - 716.3.2.1.2 – Maximum 25% of area of common wall in any room
 - Code does not permit openings protected with fire-protection-rated glazing
- 716.2.5.1.1 – Maximum size of fire-resistance-rated glazing is based on maximum size tested

Marking Requirements for Fire-Rated Glazing

- 2006 and later codes requires marking on glazing to provide an easy method to confirm code compliance both at time of installation and during annual inspections



2018 IBC Marking Requirements for Glazing

TABLE 716.1(1)
MARKING FIRE-RATED GLAZING ASSEMBLIES

FIRE TEST STANDARD	MARKING	DEFINITION OF MARKING
ASTM E119 or UL 263	W	Meets wall assembly criteria.
ASTM E119 or UL 263	FC	Meets floor/ceiling criteria ^a
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.

For SI: °C = [(°F) - 32]/1.8.

a. See Section 2409.1

Note: 450°F = 250°C

Example: A piece of fire-resistance-rated glazing meeting the wall requirements and the door requirements for 90 minutes would be marked:
D – H – T – W – 90

**TABLE 716.1(2)
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 ^b	FIRE-RATED GLAZING MARKING DOOR VISION PANEL ^{c, e}	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	See Note b	D-H-W-240	Not Permitted	4	Not Permitted	W-240
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	1½	1½	100 sq. in.	≤ 100 sq. in. = D-H-90 >100 sq. in. = D-H-W-90	Not Permitted	1½	Not Permitted	W-90
Enclosures for shafts, interior exit stairways and interior exit ramps.	2	1½	100 sq. in. ^c	≤ 100 sq. in. = D-H-90 > 100 sq. in. = D-H-T-W-90	Not Permitted	2	Not Permitted	W-120
Horizontal exits in fire walls ^d	4	3	100 sq. in.	≤ 100 sq. in. = D-H-180 > 100 sq. in. = D-H-W-240	Not Permitted	4	Not Permitted	W-240
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Fire barriers having a required fire-resistance rating of 1 hour: Enclosures for shafts, exit access stairways, exit access ramps, interior exit stairways and interior exit ramps; and exit passageway walls	1	1	100 sq. in.	≤ 100 sq. in. = D-H-60 >100 sq. in. = D-H-T-W-60	Not Permitted	1	Not Permitted	W-60

Installation Standards

- Both the IBC and the NFPA Life Safety Code reference NFPA 80, Standard for Fire Doors and Other Opening Protectives, and NFPA 105, Standard for Smoke Door Assemblies and Other Opening Protectives, 2016 / 2010 Editions, respectively



NFPA 80 Requirements – General

- **4.2 Listed and Labeled Products**
 - 4.2.1 Listed items shall be labeled
 - 4.2.2 Labels shall be applied in locations that are visible
 - 4.2.4 Specification of items of a generic nature, such as hinges, that are not labeled shall comply with the specifications contained in this standard.



NFPA 80 Requirements – General

- **4.4 Glazing Material in Fire Doors**

- **4.4.1*** Only labeled fire-resistance-rated or fire-protection-rated glazing material shall be used in fire door assemblies when permitted by the door listing.

- **4.4.2** Fire-protection-rated glazing and fire-resistance-rated glazing shall meet all applicable impact safety standard.

NFPA 80 Requirements – Care and Maintenance Cont.

- **5.1.4 Replacement** When replaced, fire doors, shutters, windows and component parts shall be replaced with components which meet the rating required for **new installations**.

NFPA 80 Requirements – Care and Maintenance Cont.

- **5.2.1 Inspection**

- **5.2.1*** Periodic inspections and testing shall be performed **not less than annually**.

- **5.2.2.3** Results of inspection, testing and maintenance shall be documented.



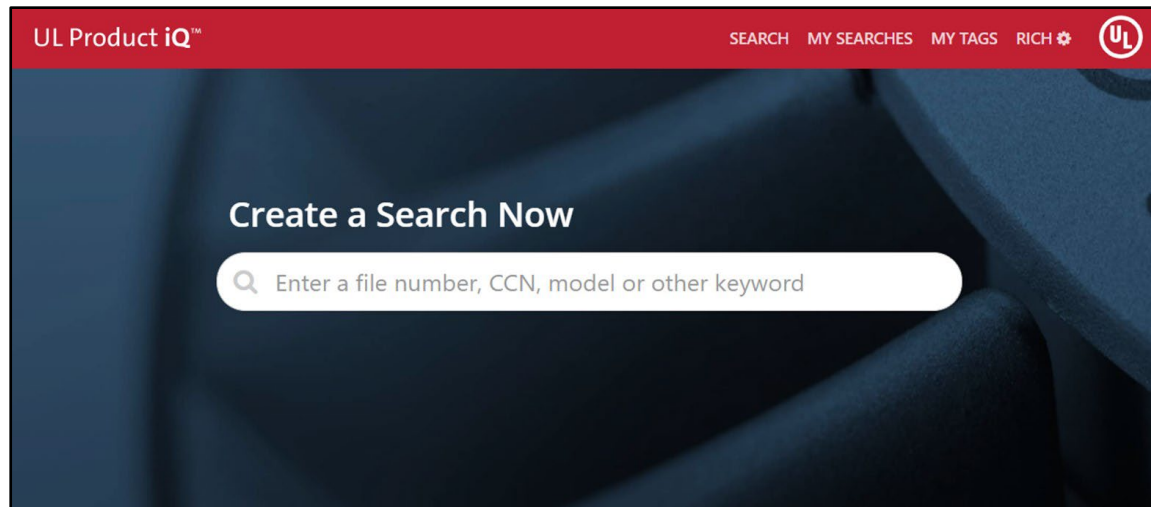
NFPA 80 Requirements – Care and Maintenance Cont.

- **5.5 Maintenance**

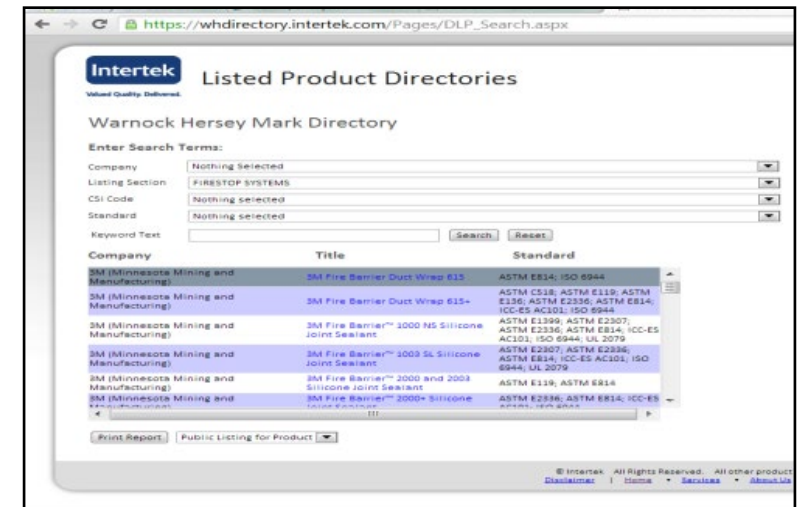
- **5.2.15.1*** Damaged glazing material shall be replaced with labeled glazing.
- **5.2.15.1.1** Replacement glazing materials shall be installed in accordance with their individual listing.

Where are Listings Found?

UL



Intertek



Questions??



Thanks for Attending!!!

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