Fire-Rated Glazing

Rich Walke
Consultant to the FCIA
Key Purposes of Fire-rated Glazing

• Allows visibility into a space
• Prevents spread of fire (compartmentation)
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
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
  • 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 1 or 2 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 radiant heat
- Classified as a “wall” rather than an opening (window)
- Meets same requirements as a gypsum or CMU wall
- When use in walls, both glass and frame must block passage of heat
Fire-resistance-rated Glazing Cont.

- May be used in multi story spans or 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
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,
  • UL 10B / UL 10C / NFPA 252, and
  • 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 and temperature requirements depending on application
Fire-protection-rated Glazing Cont.

- Used as Opening Protectives
  - Fire Windows: 20 to 90 minutes
  - Fire Doors: 20 minutes to 3 hrs
  - May not exceed 25% of the area of a fire-resistance-rated wall
  - Size shall comply with IBC and NFPA 80, and may not exceed manufacturers tested sizes
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)
• In 2012 and later codes, fire-protection-rated glazing in excess of 100 sq in. in doors in exit enclosures and exit passageways is not permitted
Standards
Fire-protection-rated Glazing Cont.

• Glazing used in fire window assemblies
  • UL 9 / NFPA 257
Conditions of Acceptance
UL 10C / UL 10B / NFPA 252

• 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
Conditions of Acceptance
UL 9 / NFPA 257

• Flame Passage
• Hose Stream after Full Duration Fire Exposure
  • Limited Openings (Max 5% Fall-Out) Permitted
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
Component Approach Used for Fire Door and Fire Window Assemblies

• 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>
<thead>
<tr>
<th>TYPE OF ASSEMBLY</th>
<th>REQUIRED WALL ASSEMBLY RATING (hours)</th>
<th>MINIMUM FIRE DOOR AND FIRE SHUTTER ASSEMBLY RATING (hours)</th>
<th>DOOR VISION PANEL SIZE</th>
<th>FIRE-RATED GLAZING MARKING DOOR VISION PANEL</th>
<th>MINIMUM SIDELIGHT/TRANSOM ASSEMBLY RATING (hours)</th>
<th>FIRE-RATED GLAZING MARKING SIDELIGHT/TRANSOM PANEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire walls and fire barriers having a required fire-resistance rating greater than 1 hour</td>
<td>4</td>
<td>3</td>
<td>See Note b</td>
<td>D-H-W-240</td>
<td>Not Permitted</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>3*</td>
<td>See Note b</td>
<td>D-H-W-180</td>
<td>Not Permitted</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1(\frac{1}{2})</td>
<td>100 sq. in.</td>
<td>≤ 100 sq. in. = D-H-90 &gt; 100 sq. in. = D-H-W-90</td>
<td>Not Permitted</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>1(\frac{1}{2})</td>
<td>1(\frac{1}{2})</td>
<td>100 sq. in.</td>
<td>≤ 100 sq. in. = D-H-90 &gt; 100 sq. in. = D-H-W-90</td>
<td>Not Permitted</td>
<td>1(\frac{1}{2})</td>
</tr>
<tr>
<td>Enclosures for shafts, interior exit stairways and interior exit ramps.</td>
<td>2</td>
<td>1(\frac{1}{2})</td>
<td>100 sq. in.*</td>
<td>≤ 100 sq. in. = D-H-90 &gt; 100 sq. in. = D-H-T-W-90</td>
<td>Not Permitted</td>
<td>2</td>
</tr>
<tr>
<td>Horizontal exits in fire walls*</td>
<td>4</td>
<td>3</td>
<td>100 sq. in.</td>
<td>≤ 100 sq. in. = D-H-180 &gt; 100 sq. in. = D-H-W-240</td>
<td>Not Permitted</td>
<td>4</td>
</tr>
<tr>
<td>3*</td>
<td>100 sq. in.</td>
<td>≤ 100 sq. in. = D-H-180 &gt; 100 sq. in. = D-H-W-180</td>
<td>Not Permitted</td>
<td>3</td>
<td>Not Permitted</td>
<td>W-180</td>
</tr>
<tr>
<td>Fire barriers having a required fire-resistance rating of 1 hour:</td>
<td>1</td>
<td>1</td>
<td>100 sq. in.</td>
<td>≤ 100 sq. in. = D-H-60 &gt; 100 sq. in. = D-H-T-W-60</td>
<td>Not Permitted</td>
<td>1</td>
</tr>
<tr>
<td>Enclosures for shafts, exit access stairways, exit access ramps, interior exit stairways and interior exit ramps; and exit passageway walls</td>
<td>1</td>
<td>1</td>
<td>100 sq. in.</td>
<td>≤ 100 sq. in. = D-H-60 &gt; 100 sq. in. = D-H-T-W-60</td>
<td>Not Permitted</td>
<td>1</td>
</tr>
</tbody>
</table>
Glazing in Fire Doors Cont.

• 716.1.2.1 – Glazing in and around fire doors must meet safety glazing criteria
  • Wired glass not permitted in or around fire doors
• 716.2.5.1 – Maximum size of fire-protection-rated glazing shall comply with Table 716.1(2) and NFPA 80
• 716.2.5.1.1 – Maximum size of fire-resistance-rated glazing is based on maximum size tested
Glazing in Fire Windows

• Section 716.3 of the 2015 IBC
• Table 716.1(3) – Establishes requirements for rating on fire window assembly based on required vertical assembly rating
<table>
<thead>
<tr>
<th>TYPE OF WALL ASSEMBLY</th>
<th>REQUIRED WALL ASSEMBLY RATING (hours)</th>
<th>MINIMUM FIRE WINDOW ASSEMBLY RATING (hours)</th>
<th>FIRE-RATED GLAZING MARKING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interior walls</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire walls</td>
<td>All</td>
<td>NP(^a)</td>
<td>W-XXX(^b)</td>
</tr>
<tr>
<td>Fire barriers</td>
<td>&gt;1</td>
<td>NP(^a)</td>
<td>W-XXX(^b)</td>
</tr>
<tr>
<td>Atrium separations (Section 707.3.6), Incidental use areas (Section 707.3.7), Mixed occupancy separations (Section 707.3.9)</td>
<td>1</td>
<td>(\frac{3}{4})</td>
<td>OH-45 or W-60</td>
</tr>
<tr>
<td>Fire partitions</td>
<td>1</td>
<td>(\frac{3}{4})</td>
<td>OH-45 or W-60</td>
</tr>
<tr>
<td>Smoke barriers</td>
<td>0.5</td>
<td>(\frac{1}{3})</td>
<td>OH-20 or W-30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(\frac{3}{4})</td>
<td>OH-45 or W-60</td>
</tr>
<tr>
<td>Exterior walls</td>
<td>&gt;1</td>
<td>(\frac{1}{2})</td>
<td>OH-90 or W-XXX(^b)</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>(\frac{3}{4})</td>
<td>OH-45 or W-60</td>
</tr>
<tr>
<td></td>
<td>0.5</td>
<td>(\frac{1}{3})</td>
<td>OH-20 or W-30</td>
</tr>
<tr>
<td>Party wall</td>
<td>All</td>
<td>NP</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>

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.
Glazing in Fire Windows Cont.

• 716.1.2.1 – Glazing in and around fire windows must meet safety glazing criteria
  • Wired glass not permitted in or around fire windows
• 716.3.4.1 – Maximum size of fire-protection-rated glazing shall comply with NFPA 80
  • NFPA 80 limits size of fire-protection-rated glazing to that specified by listing
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

Without some identification, how does one distinguish the various types of glazing?

You Can NOT!!!
Marking Requirements for Glazing

• Code required marking provides an easy method to confirm code compliance both at time of installation and during annual inspections
Marking Requirements for Glazing Cont.

- 2006 and later codes contain requirements for marking glazing with respect to its fire performance
- Requirement in 2012 IBC have changed
2018 IBC Marking
Requirements for Glazing

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
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<td>Not Permitted</td>
<td>1</td>
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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
NFPA 80 – Scope

• This standard regulates the installation and maintenance of assemblies and devices used to protect openings:
  • in walls,
  • in floors,
  • and in ceilings

“against the spread of fire and smoke”
• **4.2 Listed and Labeled Products**
  
  • **4.2.1** Listed items shall be labeled
  
  • **4.2.3** Labels shall be applied in locations that are visible
  
  • **4.2.5** 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 – Glazing

• 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 standards.
4.4.3* Glazing materials in vision panels shall be installed in labeled glass light kits or in accordance with the fire door listing and shall be installed in accordance with the manufacturer’s installation instructions.
• 5.1.3 Replacement When replaced, fire doors, shutters, windows and component parts shall be replaced with components which meet the rating required for new installations.
• **5.1.6 Removal**  Where a door or window opening is no longer in use, the opening shall be filled to maintain the required rating of the wall.
NFPA 80 Requirements –
Care and Maintenance Cont.

• 5.2.4 Periodic Inspection and Testing
  • 5.2.4.1* Periodic inspections and testing shall be performed not less than annually.
  • 5.2.4.2 Requires inspection to same criteria as original acceptance testing.
NFPA 80 Requirements – Care and Maintenance Cont.

• 5.5 Maintenance
  • 5.5.1* Repairs shall be made, and defects that could interfere with operation shall be corrected without delay.
  • 5.5.2 Damaged glazing material shall be replaced with labeled glazing.
  • 5.5.3 Replacement glazing materials shall be installed in accordance with their individual listing.
Where are Listings Found?

UL

Intertek
• Fire-resistance-rated Glazing Materials (CCET)
UL Listings

• Fire-resistance-rated Glazing Materials (CCET)
UL Listings

See General Information for Fire-resistance-rated Glazing Materials

TECHNICAL GLASS PRODUCTS
8107 BRACKEN PL SE
SNOQUALMIE, WA 98065-9258 USA
Types Pyrostop 60-281, Pyrostop 60-351 Triple, Pyrostop 60-361 Triple, Pyrostop 60-381 Triple for use in Design Nos. for use in Design Nos. U531, U533, U537, U545, U551, U552 and U558.
Type Pyrostop 120-104 for use in Design Nos. U531, U533, U537, U551, U552 and U554.
Type Pyrostop 120-202 for use in Design Nos. U531, U533, U537, U551 and U552.
Type Pyrostop 120-166 FG for use in Design Nos. U537, U552 and U554.
Type Pyrostop 120-401 for use in Design No. C901.
UL Listings

Design No. U533
June 04, 2020

Non-Bearing Wall Rating—1 or 2 Hr (See Items 1, 2 and 6)
* Indicates such products shall bear the UL or cUL Certification Mark for jurisdictions employing the UL or cUL Certification (such as Canada), respectively.
UL Product Categories

- Fire-protection-rated Glazing Materials (KCMZ)
UL Listings

• Fire-protection-rated Glazing Materials (KCMZ)
UL Listings

Fire-protection-rated Glazing Materials

See General Information for Fire-protection-rated Glazing Materials

TECHNICAL GLASS PRODUCTS
8107 BRACKEN PL SE
SNOQUALMIE, WA 98065-9258 USA

Vision Control Panels and Viulite Panels are insulating glass units which incorporate fire-resistance-rated glazing material on one side, non-rated glazing on the other side, and an operable louver or blind inside the unit.

Fire-protection-rated glazing materials

Product designation: Vision Control Panel or Viulite Panels

Thickness: Nominal 1-3/4 in. minimum

Glazing compound: “Norton” style closed cell PVC tape or Pemko FG-3000

Furnace pressure: Positive

<table>
<thead>
<tr>
<th>Rating</th>
<th>Application</th>
<th>Max Exposed Area of Glazing (sq in.)</th>
<th>Max Width of Exposed Glazing (in.)</th>
<th>Max Height of Exposed Glazing (in.)</th>
<th>Min Depth of Groove (in.)</th>
<th>Groove Width (in.)</th>
<th>Building Code Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4 h</td>
<td>Windows, Transoms or Sidelights</td>
<td>4500</td>
<td>95-1/4</td>
<td>95-1/4</td>
<td>1-1/8</td>
<td>Panel thickness plus 1/8 in</td>
<td>OH-45</td>
</tr>
</tbody>
</table>
Questions??
Thanks for Attending!!!

Rich Walke, Consultant to the Firestop Contractors International Association
4415 W. Harrison St., #540
Hillside, IL  60162
(708) 202-1108