SECTION R308
GLAZING

R308.1 Identification. Except as indicated in Section R308.1.1 each pane of glazing installed in hazardous locations as defined in Section R308.4 shall be provided with a manufacturer’s designation specifying who applied the designation, designating the type of glass and the safety glazing standard with which it complies, which is visible in the final installation. The designation shall be acid etched, sandblasted, ceramic-fired, laser etched, embossed, or be of a type which once applied cannot be removed without being destroyed. A label shall be permitted in lieu of the manufacturer’s designation.

Exceptions:

1. For other than tempered glass, manufacturer’s designations are not required provided the building official approves the use of a certificate, affidavit or other evidence confirming compliance with this code.

2. Tempered spandrel glass is permitted to be identified by the manufacturer with a removable paper designation.

\* Once glass is installed in a window frame by a manufacturer, whether that glass is safety glazing or not is not easily determined. In theory, this can be established only by breaking the particular piece of glass, in which case the glass is no longer useable. Thus, the code requires that safety glazing be marked with a manufacturer’s designation that is visible during the final building inspection. Except for tempered glass labels, labels may be omitted where approved by the
building official and an affidavit, certificate or other evidence is submitted indicating compliance with the code. A manufacturer can identify safety glazing with a removable paper designation, provided it is destroyed during removal. This ensures that the designation will not be applied to a noncomplying piece of glass.

**R308.1.1 Identification of multipane assemblies.** Multipane assemblies having individual panes not exceeding 1 square foot (0.09 m²) in exposed area shall have at least one pane in the assembly identified in accordance with Section R308.1. All other panes in the assembly shall be labeled "16 CFR 1201."

Multipane assemblies of glass need identification for the same reasons noted in Section R308.1. This provision allows labeling of only one pane of glass per Section R308.1.1, when the exposed area of each pane is 1 square foot (0.09 m²) or less. All other panes must be labeled "16 CFR 1201."

**R308.2 Louvered windows or jalousies.** Regular, float, wired or patterned glass in jalousies and louvered windows shall be no thinner than nominal 3/16 inch (5 mm) and no longer than 48 inches (1219 mm). Exposed glass edges shall be smooth.

The requirements for louvered windows exist because there is no edge support on the longitudinal edges of these panes. The code requires that the exposed edges be smooth for safety. The minimum thickness and maximum span are specified so that the glass has sufficient resistance to human impact loads.

**R308.2.1 Wired glass prohibited.** Wired glass with wire exposed on longitudinal edges shall not be used in jalousies or louvered windows.

Wired glass is not permitted if the wire is exposed on the longitudinal edge because it would be a hazard.

**R308.3 Human impact loads.** Individual glazed areas, including glass mirrors in hazardous locations such as those indicated as defined in Section R308.4, shall pass the test requirements of CPSC 16 CFR, Part 1201. Glazing shall comply with CPSC 16 CFR, Part 1201 criteria for Category I or Category II as indicated in Table R308.3.

For SI: 1 inch = 25.4 mm.
Exception: Louvered windows and jalousies shall comply with Section R308.2.

The code requires that glazing in hazardous locations subject to human impact pass the test requirements of CPSC 16 CFR, Part 1201. This is the standard developed by the Consumer Product Safety Commission (CPSC) when it was determined that former standards (such as ANSI Z97.1) were inadequate to properly protect the public from injury caused by accidental impact with glazing. The exception provides for louvered windows and jalousies complying with Section R308.2. See the categories listed in Table R308.3.

R308.4 Hazardous locations. The following shall be considered specific hazardous locations for the purposes of glazing:

1. Glazing in swinging doors except jalousies.
2. Glazing in fixed and sliding panels of sliding door assemblies and panels in sliding and bifold closet door assemblies.
3. Glazing in storm doors.
4. Glazing in all unframed swinging doors.
5. Glazing in doors and enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers. Glazing in any part of a building wall enclosing these compartments where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) measured vertically above any standing or walking surface.
6. Glazing, in an individual fixed or operable panel adjacent to a door where the nearest vertical edge is within a 24-inch (610 mm) arc of the door in a closed position whose bottom edge is less than 60 inches (1524 mm) above the floor or walking surface.
7. Glazing in an individual fixed or operable panel, other than those locations described in Items 5 and 6 above, that meets all of the following conditions:
   7.1. Exposed area of an individual pane larger than 9 square feet (0.836 m²).
   7.2. Bottom edge less than 18 inches (457 mm) above the floor.
   7.3. Top edge more than 36 inches (914 mm) above the floor.
8. One or more walking surfaces within 36 inches (914 mm) horizontally of the glazing.
9. All glazing in railings regardless of an area or height above a walking surface. Included are structural baluster panels and nonstructural infill panels.
10. Glazing in walls and fences enclosing indoor and outdoor swimming pools, hot tubs and spas where the bottom edge of the glazing is less than 60 inches (1524 mm) above a walking surface and within 60 inches (1524 mm) horizontally of the water’s edge. This shall apply to single glazing and all panes in multiple glazing.
11. Glazing adjacent to stairways, landings and ramps within 36 inches (914 mm) horizontally of a walking surface when the exposed surface of the glass is less than 60 inches (1524 mm) above the plane of the adjacent walking surface.

Exception: The following products, materials and uses are exempt from the above hazardous locations:

1. Openings in doors through which a 3-inch (76 mm) sphere is unable to pass.
2. Decorative glass in Items 1, 6 or 7.
3. Glazing in Section R308.4, Item 6, when there is an intervening wall or other permanent barrier between the door and the glazing.
4. Glazing in Section R308.4, Item 6, in walls perpendicular to the plane of the door in a closed position, other than the wall toward which the door swings when opened, or where access through the door is to a closet or storage area 3 feet (914 mm) or less in depth. Glazing in these applications shall comply with Section R308.4, Item 7.
5. Glazing in Section R308.4, Items 7 and 10, when a protective barrier is installed on the accessible side(s) of the glazing 36 inches ± 2 inches (914 mm ± 51 mm) above the floor. The barrier shall be capable of withstanding a horizontal load of 50 pounds per linear foot.

<table>
<thead>
<tr>
<th>EXPOSED SURFACE AREA OF ONE SIDE OF ONE LITE</th>
<th>GLAZING IN STORM DOORS (Category Class)</th>
<th>GLAZING IN DOORS (Category Class)</th>
<th>GLAZED PANELS REGULATED BY ITEM 7 OF SECTION R308.4 (Category Class)</th>
<th>GLAZED PANELS REGULATED BY ITEM 6 OF SECTION R308.4 (Category Class)</th>
<th>GLAZING IN DOORS AND ENCLOSURES REGULATED BY ITEM 5 OF SECTION R308.4 (Category Class)</th>
<th>SLIDING GLASS DOORS PATIO TYPE (Category Class)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 sq ft or less</td>
<td>I</td>
<td>I</td>
<td>NR</td>
<td>I</td>
<td>I</td>
<td>II</td>
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<tr>
<td>More than 9 sq ft</td>
<td>II</td>
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For SF: 1 square foot = 0.0929 m².
NR means "No Requirement."

See the commentary for Section 308.3.
foot (730 N/m) without contacting the glass and be a minimum of 1 1/2 inches (38 mm) in height.

6. Outboard panes in insulating glass units and other multiple glazed panels in Section R308.4, Item 7, when the bottom edge of the glass is 25 feet (7620 mm) or more above grade, a roof, walking surfaces, or other horizontal [within 45 degrees (0.79 rad) of horizontal] surface adjacent to the glass exterior.

7. Louvered windows and jalousies complying with the requirements of Section R308.2.

8. Mirrors and other glass panels mounted or hung on a surface that provides a continuous backing support.

9. Safety glazing in Section R308.4, Items 10 and 11, is not required where:

9.1. The side of a stairway, landing or ramp has a guardrail or handrail, including balusters or in-fill panels, complying with the provisions of Sections 1013 and 1607.7 of the International Building Code; and

9.2. The plane of the glass is more than 18 inches (457 mm) from the railing; or

9.3. When a solid wall or panel extends from the plane of the adjacent walking surface to 34 inches (863 mm) to 36 inches (914 mm) above the floor and the construction at the top of that wall or panel is capable of withstanding the same horizontal load as the protective bar.

10. Glass block panels complying with Section R610.

This section lists ten specific hazardous locations where safety glazing is required. Some of these locations are shown in Commentary Figures R308.4(1) through R308.4(9). In addition to the hazardous locations shown in the nine drawings, safety glazing is also required in a number of other locations, including fixed and sliding panels of sliding door assemblies, storm doors and glass railings.

Commentary Figure R308.4(1) illustrates several locations where safety glazing may or may not be required. To facilitate discussion, each glazed panel has been numbered. Panel 1 is not required to have a safety glazing because a protective bar has been installed in compliance with Exception 1 to Item 7, the details of which are illustrated in Commentary Figure R308.4(2). Panels 4 and 7 require safety glazing because they are door sidelights. The exception mentioned above does not apply to panels adjacent to a door, so even though Panel 7 has a protective bar, safety glazing is still required.

Commentary Figures R308.4(3) and (4) illustrate where safety glazing is required for panels adjacent to a door. This requirement applies to both fixed and operable panels. Where there is an intervening wall or permanent barrier, as shown in Commentary Figure R308.4(5),
safety glazing would not be required. Commentary Figure R308.4(6) illustrates Exception 4, which applies to glazing positioned perpendicular to the plane of the door when it is in the closed position. Only one side is considered to be the hazardous location, the side that the door swings toward. The other side need not be safety glazing. This wall has a much lower risk of problems. When a door swings open to a perpendicular wall with glazing within 24 inches (610 mm), it is possible that if the door were caught by a strong wind it could slam into the wall and break the glass, or the door knob could hit the glass and break it. There is also the possibility that someone could be caught behind the door when it is opened and they could be pushed into/through the glass. Thus, this would be an appropriate area to have the required safety glazing to protect the occupants.

Panels 8 and 9, as well as Panels 2 and 3, fall under Item 6 of Section R308.4. Under this Item all four stated conditions must occur before safety glazing is required. These conditions are as follows:

6.1 The area of an individual pane must be more than 9 square feet (0.84 m²);
6.2 The bottom edge must be less than 18 inches (457 mm) above the floor;
6.3 The top edge must be more than 36 inches (914 mm) above the floor; and
6.4 One or more walking surfaces must be within 36 inches (914 mm), measured horizontally from the glazed panel.

Panels 2 and 3 do not require safety glazing because their bottom edges are not less than 18 inches (457 mm) from the floor.

If Panels 8 and 9 have a walking surface within 36 inches (914 mm) of the interior, safety glazing would be required. From the exterior side, as shown in Commentary Figure R308.4(1), the bottom of the panel appears to be more than 18 inches (457 mm) above the exterior walking surface, so the exterior condition would have no bearing on the determination. Panels 5 and 6 are glass doors, which require safety glazing based on the provisions of Items 1 or 4. Most ingress and egress doors (except jalousies), unframed swinging doors and glazing in storm doors require safety glazing, but there are several exceptions. If openings in a door will not pass a 3-inch diameter (76 mm) sphere, the glazing is exempt, as are assemblies of sheeted, faceted or carved glass used for decoration. The latter exception applies to not only doors but also to sidelights and other glazed panels covered by Items 5 and 6.

Commentary Figure R308.4(7) illustrates the condition where a window occurs within a shower enclosure. If this window is less than 60 inches (1524 mm) above a standing surface, safety glazing would be required. This same requirement applies not only to showers but also to windows installed adjacent to hot tubs, whirlpools, saunas, steam and bathtubs. Because of the presence of moisture, all of these locations represent slip hazards and need safety glazing to prevent injury in the event of a fall.
Glass in railings, balusters panels and in-fill panels, regardless of their height above a walking surface, require safety glazing. Because of the high probability that people will strike guards, it is critical that an increased level of protection be provided.

Commentary Figure R308.4(8) illustrates the requirements of Item 9. This provision applies to walls and fences used as barriers for indoor or outdoor swimming pools and spas. Before safety glazing is required, the glazed panels must be within 5 feet (1524 mm) above the deck for a pool or spa. Items 10 and 11 address the hazardous locations to be considered for stairways, landings and ramps. Stairways and ramps present users with a greater risk for injury caused by falling than a flat surface. Not only is the risk of falling greater when using a stair, but the injuries are generally more severe. Unlike falling on a flat surface where the floor will, for the most part, break a person's fall, there is nothing to stop someone from continuing to fall until he or she reaches the bottom of the stair. The increased risks inherent in stairways, as well as attempting to be consistent with other chapters in the code that mandate more restrictive requirements when addressing safety issues involving stairs and ramps, account for the more restrictive requirements for glazing in and around stairways and ramps. Item 10 includes any glazing within 36 inches (914 mm) horizontally of any walking surface when the exposed surface of that glazing is within 60 inches (1524 mm) of the walking surface. The walking surface in question would be part of a stair or ramp itself, including top, bottom and intermediate landings. It does not include adjacent floors or other walking surfaces [see Commentary Figure R308.4(9)].

In Item 11, the concern is any glass that may be located within 60 inches (1524 mm) from the bottom tread in a run of stairs and within 60 inches (1524 mm) vertically of the walking surface of a stair. The
code does not distinguish between a bottom tread at the primary floor level or at an intermediate landing. The last tread in a run of steps is the bottom tread. The 60-inch (1524 mm) dimension is from any point on the bottom tread, horizontally in any direction to any surface of any glazing within that range. Commentary Figure R308.4(9) illustrates the applications of Item 11. Safety glazing is not required for Items 10 and 11 where (1) the side of the stairway, landing or ramp has a guardrail or handrail, including the balusters or in-fill panels which comply with Sections 1013 and 1607.7 of the IBC which address the load resistance requirements of handrails and guardrails, (2) the actual plane of the glazing is located at least 18 inches (457 mm) from the glass and (3) a solid wall or panel extends to cover the area between 34 (863 mm) and 36 inches (914 mm) above the landing installing a bar is no longer necessary if the wall can resist the same load as the bar. The wall must be able to resist the same horizontal load at the top as the required protective bar listed in Exception #5 above.

Both the IRC and the IBC exempt glass unit masonry from hazardous locations. Glass block is becoming more prevalent in the design of homes. One of the more common uses is enclosures for walk-in showers. The IBC allows the use of glass block when installed in accordance with Section 2110. Section R610 of the IRC is almost identical to Section 2110 of the UBC. Exception 10 allows glass block installations without having to meet safety glazing requirements.

R308.5 Site built windows. Site built windows shall comply with Section 2404 of the International Building Code.

- Because site-built windows are not constructed in a manufacturing facility that follows industry standards, they must be constructed in accordance with Section 2404 of the IBC, which sets forth the wind, snow and dead loads on glass.

R308.6 Skylights and sloped glazing. Skylights and sloped glazing shall comply with the following sections.

- Sloped glazing and skylights consist of glazing installed in roofs or walls that are on a slope of more than...
15 degrees (0.26 rad) or more from the vertical. The provisions of the IRC address loads normally attributed to roofs. The provisions also enhance the protection of the occupants of a building from the possibility of falling glazing materials.

R308.6.1 Definitions.

SKYLIGHTS AND SLOPED GLAZING. Glass or other transparent or translucent glazing material installed at a slope of 15 degrees (0.26 rad) or more from vertical. Glazing materials in skylights, including unit skylights, solariums, sunrooms, roofs and sloped walls are included in this definition.

The failure of skylights and sloped glazing could result in injury and building damage. This definition establishes the criteria to which the code requirements of Section R308.6 are to apply.

UNIT SKYLIGHT. A factory assembled, glazed fenestration unit, containing one panel of glazing material, that allows for natural daylighting through an opening in the roof assembly while preserving the weather-resistant barrier of the roof.

Unit skylights are a specific type of sloped glazing assembly which is factory assembled. The IBC and IRC contain specific code provisions that are appropriate for this type of building component. Factory-assembled units, as opposed to site-built skylights, can be designed, tested and rated as one component which incorporates both glazing and framing, if applicable. The individual components of site-built glazing must be designed to resist the design loads of the codes individually, and are not usually rated as an assembly.

R308.6.2 Permitted materials. The following types of glazing may be used:

1. Laminated glass with a minimum 0.015-inch (0.38 mm) polyvinyl butyral interlayer for glass panes 16 square feet (1.5 m²) or less in area located such that the highest point of the glass is not more than 12 feet (3658 mm) above a walking surface or other accessible area; for higher or larger sizes, the minimum interlayer thickness shall be 0.030 inch (0.76 mm).

2. Fully tempered glass.

3. Heat-strengthened glass.

4. Wired glass.

5. Approved rigid plastics.

The provisions of this section limit glazing materials in skylights and sloped glazing to those specified, and they outline glazing materials and protective measures for sloped glazing and skylights. The materials and their characteristics and limitations are as follows:

Laminated glass. Laminated glass is usually constructed with an inner layer of polyvinyl butyral, which has a minimum thickness of 30 mil (0.76 mm). Such glass is highly resistant to impact and as a result requires no further protection below. When used within dwelling units, laminated glass is permitted to have a 15-mil (0.38 mm) polyvinyl butyral inner layer if each pane of glass is 16 square feet (1.5 m²) or less in area, and the highest point of the glass is no more than 12 feet (3658 mm) above a walking surface or other accessible area.

![Figure R308.6(7) GLAZING WITHIN A SHOWER ENCLOSURE](image)

For 1:1 inch = 25.4 mm.
**Fully tempered glass.** Tempered glass is glass that has been specifically heat-treated or chemically treated to obtain high strength. When broken, the entire piece of glass immediately breaks into numerous small granular pieces. Because of its high strength and manner of breakage, tempered glass has been considered in the past to be a desirable glazing material for skylights that have no protective screens. However, as a result of studies by the industry that show that tempered glass is subject to spontaneous breakage that can result in large chunks of glass falling, the IRC requires screen protection below tempered glass.

**Heat-strengthened glass.** Heat-strengthened glass is glass that has been reheated to just below its melting point and then cooled. This process forms a compression on the outer surface and increases the strength of the glass. However, heat-strengthened glass requires screen protection below the skylight to protect the occupants from falling shards.

**Wired glass.** Wired glass is resistant to impact and when used as a single-layer glazing requires no additional protection below.

**Approved rigid plastics.** Rigid plastics are fairly durable as a glazing material.

**Annealed glass.** Annealed glass is not allowed because it is subject to breakage by impact and has very low strength. Annealed glass is also unsatisfactory for use as a skylight because it breaks up under impact into large sharp shards, which, when they fall, are hazardous to occupants of a building.

R308.6.3 Screens, general. For fully tempered or heat-strengthened glass, a retaining screen meeting the requirements of Section R308.6.7 shall be installed below the glass, except for fully tempered glass that meets either condition listed in Section R308.6.5.

- As a general rule, single-layer glazing of heat-strengthened glass and fully tempered glass must be fitted with screens below the glazing material.

R308.6.4 Screens with multiple glazing. When the inboard pane is fully tempered, heat-strengthened or wired glass, a retaining screen meeting the requirements of Section R308.6.7 shall be installed below the glass, except for either condition listed in Section R308.6.5. All other panes in the multiple glazing may be of any type listed in Section R308.6.2.

- As does Section R308.6.3, this section states that screens are required for the inboard plane of glazing when it is fully tempered, heat-strengthened or wired glass. The screen must comply with Section R308.6.7. Screens are not required for either approved laminated glass or approved rigid plastics.

R308.6.5 Screens not required. Screens shall not be required when fully tempered glass is used as single glazing or the
inboard pane in multiple glazing and either of the following conditions are met:

1. Glass area 16 square feet (1.49 m²) or less. Highest point of glass not more than 12 feet (3658 mm) above a walking surface or other accessible area, nominal glass thickness not more than 3/16 inch (4.8 mm), and (for multiple glazing only) the other pane or panes fully tempered, laminated or wired glass.

2. Glass area greater than 16 square feet (1.49 m²). Glass sloped 30 degrees (0.52 rad) or less from vertical, and highest point of glass not more than 10 feet (3048 mm) above a walking surface or other accessible area.

Section R308.6.5 states two exceptions to the provisions of Sections R308.6.3 and R308.6.4. The first exception applies to glazing that is no larger than 16 square feet (1.49 m²) and is no more than 12 feet (3658 mm) above a walking surface or other accessible area. The second exception applies to sloped glazing with a maximum slope of 30 degrees (0.52 rad) from vertical, is not larger than 16 square feet (1.49 m²) in area, and is no greater than 10 feet (3048 mm) above a walking surface or other accessible area. Generally, installed skylights and sloped glazing will meet one of these exceptions, so screens are not required.

**R308.6.6 Glass in greenhouses.** Any glazing material is permitted to be installed without screening in the sloped areas of greenhouses, provided the greenhouse height at the ridge does not exceed 20 feet (6096 mm) above grade.

The glazing regulations for greenhouses are less stringent because greenhouses are seldom occupied during storms that might break the glass. These provisions also explain an exception to the screening provisions of Sections R308.6 and R308.6.4, specifically for the sloped glazing areas within greenhouses. Screens are not required for sloped areas of greenhouses if the ridge of the greenhouse is not more than 20 feet (6096 mm) above grade.

**R308.6.7 Screen characteristics.** The screen and its fastenings shall be capable of supporting twice the weight of the glazing, be firmly and substantially fastened to the framing members, and have a mesh opening of no more than 1 inch by 1 inch (25 mm by 25 mm).

It is critical that screens be installed in a manner that will adequately support the weight of the glass. In using a safety factor of 2, the screen and its fastenings must be capable of supporting twice the weight of the glazing. To accomplish this, the screen is to be fastened firmly to the framing members.

**R308.6.8 Curbs for skylights.** All unit skylights installed in a roof with a pitch flatter than three units vertical in 12 units horizontal (25-percent slope) shall be mounted on a curb extending at least 4 inches (102 mm) above the plane of the roof unless otherwise specified in the manufacturer’s installation instructions.

Skylights installed on low-sloped roofs are more susceptible to leaking than those on higher pitched roofs because water does not drain as quickly on low-sloped roofs.

For these skylights to be properly flashed to prevent leakage, they must be placed on a 4-inch (102 mm) high curb unless the manufacturer’s installation instructions indicate otherwise.
R308.6.9 Testing and labeling. Unit skylights shall be tested by an approved independent laboratory, and bear a label identifying manufacturer, performance grade rating and approved inspection agency to indicate compliance with the requirements of AAMA/WDMA/CSA 101/1.S.2/A440.

- The referenced standard, AAMA/WDMA 101/1.S.2/ A440, Voluntary Performance Specification for Windows, Skylights and Glass Doors, includes a separate rating system for positive and negative pressure on skylights which allows the manufacturer to design and fabricate products that are best suited for the climate in which they will be used. Standard 101/1.S.2/NAFS establishes the performance requirements for skylights based on the desired performance grade rating which includes minimum requirements for resistance to air leakage, water infiltration and the design load pressures. The resulting performance grade rating states the design load pressure used to rate the product, but it also includes consideration of these additional performance characteristics. For skylights certified for only one performance grade, the rating is based on the minimum requirements met for both positive and negative design pressure. Skylights certified for two performance grades are rated separately for positive and negative design pressure.

- Skylights must be capable of withstanding the component and cladding wind pressures of Table R301.2(2) adjusted by the height and exposure coefficients given in Table R301.2(3).

- The most critical load on a skylight is determined by the climate in which it is installed. In a colder climate with heavier snow loads and moderate design wind speeds, the positive load on a skylight from the combined snow and dead load will be more critical than the negative load from wind uplift. The opposite will be the case in warmer, coastal climates with higher design wind speeds, and little or no snow load.