Courtesy of the American Architectural Manufacturers Association

The family of International Codes published by the International Code Council is the most widely used set of model codes in the history of U.S. construction codes. In addition to their widespread use throughout the 50 states, numerous federal agencies—including the National Park Service and the U.S. Department of Defense—have also adopted the International Codes. ICC is also starting to be adopted in countries other than the U.S., particularly in the Middle East.

The following is intended as a summary of the major requirements set forth for windows, doors and other fenestration products in the 2012 International Residential Code, the 2012 International Building Code and the 2012 International Energy Conservation Code. Manufacturers and dealers that sell products in several states should be aware, however, that at this point, multiple editions of the International Codes are being enforced by various U.S. jurisdictions.

Most states and local jurisdictions are currently using the 2009 editions of these codes. According to the ICC website—as of fall 2013—the 2009 IRC is being enforced either locally or statewide in 22 states and the 2009 IECC is being enforced either locally or statewide in 32 states.

Several states and local jurisdictions are still using the 2006 edition of these codes as well. The ICC website indicates the 2006 IRC is being enforced either statewide or locally in 11 states. There are even a few states that are still enforcing one of the first two editions of the IRC–the 2000 or 2003 edition.

Adoption and enforcement of the 2012 editions of the International Codes, however, has begun to get traction. According to the ICC website, as of fall 2013, the 2012 IRC and the 2012 IECC were being enforced, either statewide or locally, in seven states. Various other states, including Florida and California, are completing their adoption of the 2012 I-codes and are expected to begin enforcing them, with state amendments, in 2014.

The ICC website (www.iccsafe.org) offers updated information on which edition of its codes is in effect in each state and various cities and counties around the country.

The user of this summary is also cautioned to realize it is not a full discussion of all the requirements of the 2012 International Codes for fenestration products. Relevant sections of the codes are identified and more specific information can be gained by obtaining a copy of the relevant code or codes from ICC. It is also important to note that some jurisdictions adopt one or more of the International Codes, and then make their own amendments at the state or local level. As a result, many jurisdictions have their own versions of these particular codes.

This summary does not attempt to address all of these variations of the base model code. In some cases, these jurisdictional-specific versions of the International Codes can be obtained from the ICC. In other cases, the jurisdictional-specific versions must be obtained directly from that particular jurisdiction. Contact information for ICC and other organizations mentioned in this article can be found in the Association Directory.

RECENT CHANGES

There are several significant changes between the 2009 edition and the 2012 edition of the International Codes that relate to fenestration products. Cumulatively, these changes include:

- An update to the 2011 edition of AAMA/WDMA/CSA 101/I.S.2/A440-11 NAFS/North American Fenestration Standard/Specification for Windows, Doors, and Skylights,
- Removal of separate energy conservation provisions for residential construction in both the IECC and the IRC
- Updating to the strength design based wind speed maps of ASCE 7-10 Minimum Design Loads for Buildings and Other Structures for the determination of design wind pressure in the IBC
- The addition of an exception to the minimum window sill height requirements for windows equipped with window opening control devices (WOCDs) in the IRC and IBC,
- A change in the minimum sill height required for operable windows in the IBC.

TESTING AND LABELING OF WINDOWS AND DOORS

Exterior windows and doors are covered in Section 1710.5 of the 2012 IBC and Section R612 of the 2012 IRC. These sections require windows and sliding doors to be tested and labeled in accordance with AAMA/WDMA/CSA 101/I.S.2/A440-11. The standard was developed jointly by the American Architectural Manufacturers Association, the Window & Door Manufacturers Association and the Canadian Standards Association. (The complete document is available from all three organizations.)

The 2011 edition of the standard referenced in the 2012 IBC and IRC represents an update from the previous reference to AAMA/WDMA/CSA 101/I.S.2/A440-08 in the 2009 IBC, IECC and IRC. As in the 2009 IBC/IRC, the latest edition of the standard applies to windows and "sliding doors" in the 2012 IBC and 2012 IRC. Other types of fenestration assemblies not included within the scope of AAMA/WDMA/CSA 101/I.S.2/A440-11, including curtain wall and storefront, are also addressed in Section 1710.5 of the 2012 IBC. These assemblies are to be tested to 1.5 times allowable stress design load in accordance with ASTM E330-02, and the glass is to be designed in accordance with ASTM E1300-07e01.

Exterior swinging doors can be tested and labeled in accordance with AAMA/WDMA/CSA 101/I.S.2/A440-11 or tested to 1.5 times allowable stress design load in accordance with ASTM E330-02. The 2012 IBC also permits garage doors to be tested to ANSI/DASMA 108-05, in lieu of ASTM E330.

AAMA/WDMA/CSA 101/I.S.2/A440-11 contains provisions for some types of exterior swinging doors. AAMA has also put into place a program to certify these types of products for compliance with this standard. This program depends upon testing of each proposed door assembly, rather than the component-based approach offered by ANSI A250.13 and others.

Unit skylights are also required to be tested and labeled in accordance with AAMA/WDMA/CSA 101/I.S.2/A440-11 by both the 2012 IBC and 2012 IRC. Unit skylights are factory manufactured fenestration assemblies intended to be installed in a single roof opening without intermediate framing members. Tubular daylighting devices are included within the definition of unit skylights in the 2012 IBC and 2012 IRC.

The requirements for skylights and sloped glazing occur in Section 2405 of the 2012 IBC and R308.6 of the 2012 IRC. Section 2405.5 permits unit skylights to be evaluated for different positive and negative design pressures. This is unique to unit skylights. Skylights are subject to snow load as well as wind and dead load. The combination of these loads will often result in varying required ratings for positive and negative pressures on unit skylights.

The 2012 IBC requires exterior wall cladding systems—including curtain wall, storefront and punched openings—in high wind areas to be subject to special inspections. The high wind areas are determined by exposure category of the building. If the building is in Exposure Category B (surrounded by low- to mid-rise buildings) then special inspection is required if the Allowable Stress Design wind speed is 120 mph or greater. If the building is in Exposure Category C (open prairies) or D (near large bodies of water) then special inspection is required if the Allowable Stress Design wind speed is 110 mph or greater.

Special inspections, by definition in the IBC, are to be performed by persons who are specifically qualified to inspect the installation in question. They are only required for that part of the system design that requires a registered design professional. So for a punched window opening, the special inspection would be of the structural components—predominately the anchorage—whose design must be conducted by a registered design professional.

DESIGN LOADS

Provisions for design loads are set forth in Section R301 of the 2012 IRC and Chapter 16 of the 2012 IBC. The design loads of concern for vertical glazing are design wind load and impact resistance. Skylights and sloped glazing are also subject to snow load and dead load.

Wind Loads—Tables R301.2(2) and R301.2(3) of the 2012 IRC give the design wind loads for glazed openings, based on the design wind speed of the specific location where construction is to take place, the mean height of the building and its exposure. These tables are based on the Allowable Stress Design wind speeds given in the 2012 IRC.

There are significant changes to the design wind load requirements for fenestration between the 2009 IBC and the 2012 IBC. These are due to significant changes to the wind load provision of the ASCE 7 standard between the 2005 and 2010 editions. For the most part, however, these changes were not brought forth for the 2012 IRC.

The design wind load provisions of the 2005 and earlier editions of ASCE 7 were based upon Allowable Stress Design of building components. The intent of this method was to provide loads to which the building components had a fairly high likelihood of being exposed during the service life of the building. The building components were then designed to remain serviceable (i.e. not require replacement) when subjected to that load.

The 2010 edition of ASCE 7 provides design wind load provisions that are based upon Strength Design of building components. This method provides loads that have a lower likelihood of occurring during the service life of the building. The building components are then designed not to fail (rupture) when subjected to that load.

This change in methodology results in higher design wind speeds and pressures when Strength Design Loads are calculated. At first glance, this might give the appearance of requiring higher DP ratings for exterior windows, doors and skylights. In actuality, the 2012 IBC contains provisions to multiply this new, higher Strength Design load by a factor of 0.6 for the purpose of conversion to the more traditional method of determining the design wind pressure based upon Allowable Stress Design. It is very important that the builder, code official, manufacturer and anyone else involved in choosing or approving the windows, doors or skylights for a particular application understand that the higher design wind pressure provided by the 2012 IBC must be multiplied by this 0.6 conversion factor for the purposes of comparison to the Design Pressure rating of the fenestration product. In most, but not all, cases this conversion results in required design pressure ratings for fenestration that are roughly comparable to the more traditionally determined values. AAMA, WDMA, FMA and DASMA have published a technical bulletin on this topic. This bulletin can be downloaded from the AAMA website at www.aamanet.org.

ASCE7-10 also provides three different design wind speed maps. The different maps are based upon the assigned Risk Category of the building being designed.

There is one map for buildings whose collapse would present a low risk to human life. These include barns and storage facilities.

There is a second map for buildings whose collapse is considered to be a moderate hazard to human life. Most buildings fall within this category, including low rise residential buildings. The new maps result in higher design wind loads for buildings in this category than for those that present a low risk to human life.

There is a third map for buildings whose collapse is considered a high threat to human life, and for those which are considered essential facilities. The former includes assembly or education buildings designed to house groups of 250 or more people, outpatient type medical care facilities, prisons and any other buildings designed to house 5,000 people or more. Essential facilities include occupancies such as hospitals, police and fire stations, emergency shelters and power generating facilities. The integrity of these buildings is essential during emergency response situations.

The highest design wind speeds are given by the third map for buildings of high hazard to human life and essential facilities. These wind speeds results in the highest design wind loads. Previous editions of ASCE 7 and the IBC also required these types of buildings to be designed to higher design loads, but the actual increase was applied in a different manner.

The 2012 IRC retains the traditional method of determining design wind pressure based upon Allowable Stress Design. For the most part, the required DP rating of the 2012 IRC for fenestration therefore has not changed. There have been some changes to the design wind speed map, however, that will change the actual required DP rating in some coastal areas. The user of the 2012 IRC should be aware that, unlike the 2012 IBC, the design wind pressure values obtained from the 2012 IRC are not to be multiplied by 0.6 for the purposes of comparison to the DP rating of the fenestration product. The design wind pressure values of the 2012 IRC have already been adjusted to be consistent with other design provisions of the 2012 IRC that are based upon Allowable Stress Design. This includes the DP rating of fenestration products under AAMA/WDMA/CSA 101/I.S.2/A440.

There has been concern that the two sets of provisions in the commercial code (IBC) vs. the residential code (IRC) could result in confusion when they are implemented. Therefore some states, such as Florida, have amended the 2012 IRC for consistency to the design wind load provisions of the 2012 IBC.

Dead Loads—The provisions for dead load in Section 1606 of the 2012 IBC are also based on ASCE 7-10. There are no significant changes to the dead load requirements for fenestration between the 2009 IBC and 2009 IRC, and the 2012 editions of the same codes.

Impact Resistance—Section 1609.1.2 of the 2012 IBC and Section R301.2.1.2 of the 2012 IRC outline the locations where impact-resistant products are required. All exterior openings in wind-borne debris areas are required to be impact resistant in the 2012 IBC and 2012 IRC.

The geographical locations where impact protection of openings is required are similar to those given in ASCE 7-10 and are primarily defined by design wind speed. Since three different design wind speed maps are given in the 2012 IBC, it means some areas may be considered wind-borne debris areas for buildings such as essential facilities, but not for buildings whose collapse is considered to be of moderate threat to human life. In other words, in some parts of the country impact-resistant openings will be required for hospitals and police and fire stations, but not for office buildings and retail stores. It may be appropriate to provide a higher level of safety for the former buildings, but it will also require those selling fenestration products in those areas to be aware of this distinction and when it applies in their market.

Products that need to meet impact resistance requirements must be tested to one of a few different sets of standards. One option that exists in both the 2012 IBC and 2012 IRC is testing in accordance with ASTM E1886-05 and ASTM E1996-09, which must be used together. The 2012 IRC also recognizes the AAMA 506 certification label tab as evidence that a product has been tested appropriately. The AAMA 506 tab provides a method for window manufacturers to demonstrate that their product has been successfully tested in accordance with ASTM E 1886 and ASTM E 1996 by placing a tab right on their product, adjacent to the required AAMA/WDMA/CSA 101/I.S.2/A440 label. Both the 2012 IBC and IRC also permit the use of "other approved tests." This may include Miami-Dade County test protocols, if approved by the authority having jurisdiction.

For residential applications, use of protective wood panels as an alternative to impact-resistant glazing or shutters continues to be permitted for limited applications. The 2012 IBC and IRC limit the use of protective wood panels to openings in one- and two-story, single-family dwellings, duplexes and residential care facilities.

ENERGY

Requirements for energy performance in both residential and commercial buildings are spelled out in the 2012 International Energy Conservation Code. The energy conservation requirements for one- and two-family homes and townhouses three stories or less in height are also given in Chapter 11 of the 2012 IRC. Beginning with the 2012 International

Codes, however, the energy conservation provisions of Chapter 11 of the IRC are an exact duplicate of the provisions of the IECC for the same building. Previously, there was some variation in the energy performance requirements for residential buildings that were included in both the IECC and the IRC. In jurisdictions using the 2009 or earlier editions of the IECC and IRC, it is essential to verify which set of requirements are to be complied with for residential construction before beginning a project.

The 2012 IECC has three compliance paths for residential construction and two compliance paths for commercial construction. For both residential construction and commercial construction, one available path of compliance is the prescriptive path, which is the simplest to use, providing one set of energy efficiency requirements for each component of the building envelope.

For residential construction, under the prescriptive provisions there is no limit on the percentage of glazing in the exterior wall. There is also no limit on the percentage of roof area that is skylights under the prescriptive provisions for residential construction.

Use of the prescriptive path in commercial buildings is limited to buildings where the vertical glazing and skylight area do not exceed certain limits. New to the 2012 IECC, these limits are dependent upon whether or not automatic daylighting controls are provided in the daylit areas of the building. The limit on vertical glazing also depends upon the extent to which the interior of the building is daylit.

If (1) a building is equipped with automatic daylighting controls, (2) at least 50 percent of the conditioned floor area is in a daylight zone, and (3) the glazing has a VT/SHGC ratio greater than 1.1, then 40 percent of the above grade wall area of a commercial building is permitted to be fenestration area. If all three of these criteria are not met, then the fenestration area is limited to 30 percent of the above grade wall area.

Similarly for skylights, if a building is equipped with automatic daylighting controls, up to 5 percent of the roof area is permitted to be skylights. If the building is not equipped with automatic daylighting controls, then skylights are not to exceed 3 percent of the roof area under the prescriptive provisions of the 2012 IECC.

Automatic daylighting controls reduce the level of artificial lighting provided when daylighting is provided to a room or space. Combining automatic daylighting controls with well-placed fenestration allows fenestration to have a positive impact on the overall energy use of the building by reducing the lighting load during daylight hours.

The prescriptive paths for both residential and commercial construction establish maximum permitted U-factors and solar heat gain coefficients for fenestration. U-factor is to be determined in accordance with NFRC 100-09 or by use of a default table in the 2012 IECC. Similarly, the SHGC of the fenestration is to be determined in accordance with NFRC 200-09 or by use of a default table in the 2012 IECC. Figs. 1 and 2 show the maximum permitted U-factors and SHGC for vertical fenestration and skylights in low-rise residential construction when the prescriptive path of the 2012 IECC and 2012 IRC is used.

The residential provisions of the 2012 IECC apply to one and two family homes, and other types of residential buildings, such as multifamily buildings and assisted-living facilities, that are three stories or less in height. For these buildings, the

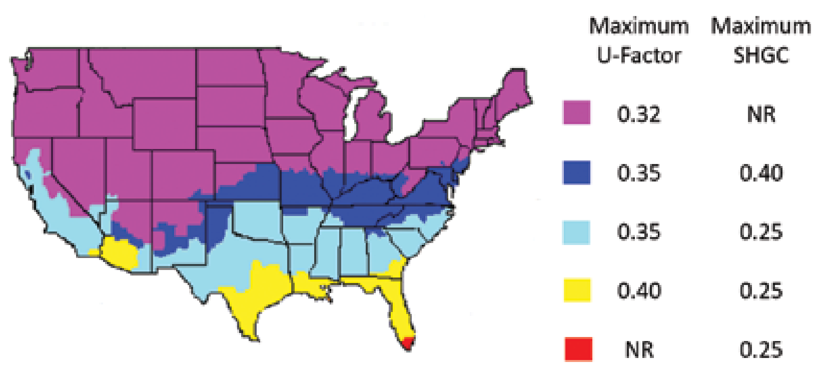


Fig. 1—Maximum U-factor and SHGC values for vertical fenestration in low-rise residential construction in the 2012 IECC and IRC

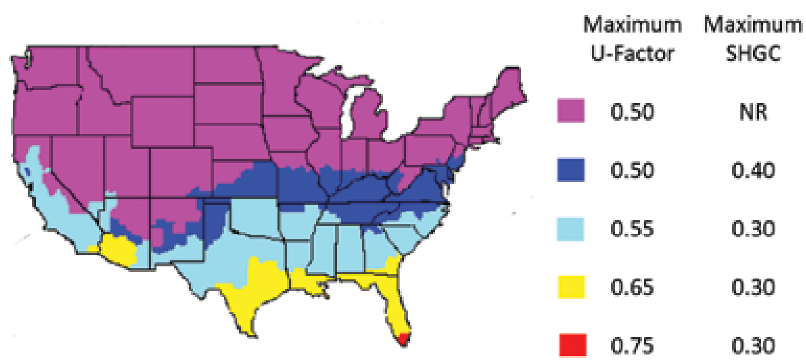


Fig. 2—The maximum U-factors and SHGC for skylights in low-rise residential construction

residential provisions of the 2012 IECC govern if it has been adopted by the applicable jurisdiction. Other types of residential occupancies, such as multifamily buildings and assisted living facilities greater than three stories in height, and hotels and motels of any height, are governed by the provisions of the 2012 IECC for commercial buildings.

The other two compliance paths for residential construction in the 2012 IECC permit some tradeoffs in levels of energy efficiency from one building component to another. One of these—designated the UA alternate method—only permits tradeoffs between different elements of the building envelope. The other method—performance-based design of the whole building—permits tradeoffs between some components of the residence that impact energy use. The ability to trade off a more efficient mechanical system for other components of the building, however, is not included in the list of permitted tradeoffs in the 2012 IECC. This change from previous editions of the IECC removed a significant incentive to builders to install more efficient mechanical systems than what is currently required by federal law.

Beyond not being able to trade off for the installation of more efficient mechanical systems, the amount of tradeoff that is permitted for fenestration when following the UA alternate or whole building performance compliance paths also continues to be capped in the 2012 IECC. In the Northern climate zones (climate zones 6 to 8, which correspond roughly with Wisconsin to Alaska), the U-factor, when trade offs are used, is not to exceed 0.40. In mid-level climates zones 4 and 5 (Northern Tennessee to Southern Wisconsin), the U-factor is not to exceed 0.48. In Southern climate zones 1 to 3 (Tennessee on south to the tip of Florida), there is no U-factor cap, but the SHGC is not to exceed 0.50 when tradeoffs are used. When one of the alternative compliance paths is used, the U-factor of skylights in climate zones 4 to 8 is not to exceed 0.75. The same SHGC cap of 0.50 that applies to vertical fenestration in climate zones 1 to 3 also applies to skylights.

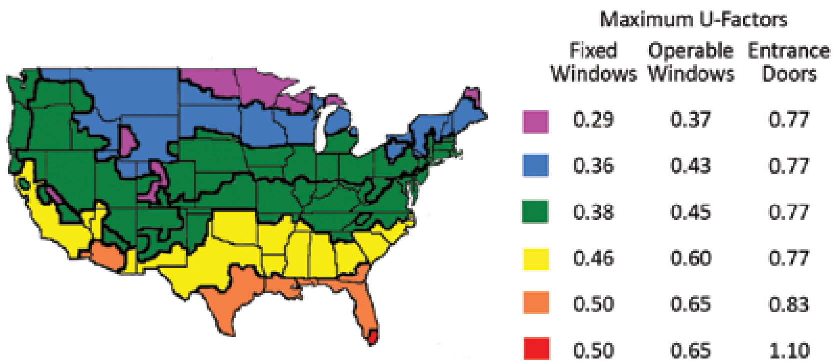


Fig. 3—Maximum U-factor and SHGC values for vertical fenestration in commercial construction in the 2012 IECC

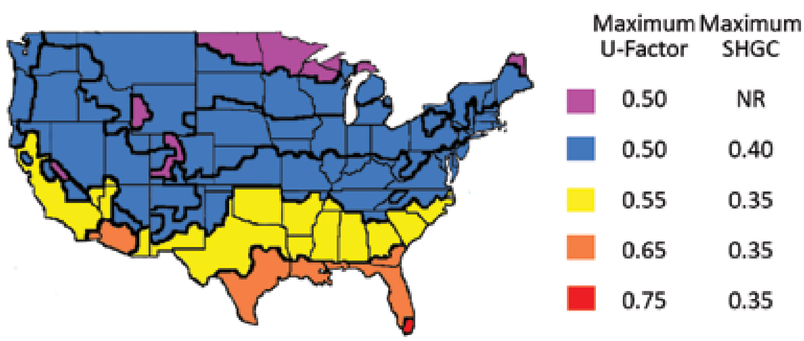


Fig. 4—Maximum U-factor and SHGC values for sklights in commercial construction in the 2012 IECC

The U-factor requirements discussed above for vertical fenestration also apply to exterior glass doors. Glass doors, by definition in the IECC, are considered to be doors which are more than 50 percent glass in area. If the door is equal to or less than 50 percent glass in area, it is considered to be an opaque door. Although opaque doors are included in the definition of fenestration area in the 2012 IECC and 2012 IRC, they are assigned a maximum U-factor of 0.35, separate from the U-factor requirements for glazing area. According to Table R303.1.3 of the IECC, this criteria is considered to be met by any insulated, nonmetal edge opaque door with glazing less than 45% of the door area, if any glazing that does occur in the door is double pane. Also, one opaque door up to 24 square feet in area is exempt from the maximum U-factor requirement in the 2012 IECC and 2012 IRC.

The 2012 IECC and IRC require air leakage resistance of windows, door assemblies and unit skylights to be determined in accordance with AAMA/WDMA/CSA 101/I.S.2/A440-11 or NFRC 400-09, similar to the requirements in the 2009 IECC and IRC. The 2012 IECC also requires air-leakage resistance of curtain wall, storefront glazing and commercial doors to be determined in accordance with ASTM E 283-04.

Previous editions of the IECC used the same pass/fail criteria for air leakage of window, door and skylights in commercial buildings as that established by AAMA/WDMA/CSA 101/I.S.2/A440. The 2012 IECC, however, establishes more stringent criteria than that currently in place for certain Performance Classes for windows in commercial buildings. Specifically, the maximum air leakage rate permitted for windows, sliding and swinging doors, and unit skylights without condensation weepage openings in commercial buildings is 0.2 cfm/ft^2 when tested at 1.57 psf. The maximum air leakage rate permitted by AAMA/WDMA/CSA 101/I.S.2/A440 for some Performance Classes of fenestration is 0.3 cfm/ft^2 when tested at the same pressure.

Previous editions of the IECC contained separate provisions for metal and nonmetal framed windows and doors other than the main entrance door in commercial buildings. This distinction has been discontinued in the 2012 IECC. The 2012 IECC establishes maximum U-factors for fenestration in commercial buildings based upon whether it is a fixed, operable, or entrance door. Figs. 3 and 4 show the maximum U-factor and SHGC permitted for fenestration in commercial buildings under the prescriptive provisions of the 2012 IECC.

EMERGENCY ESCAPE AND RESCUE OPENINGS

Both the 2012 IBC and 2012 IRC require emergency escape and rescue openings in sleeping rooms below the fourth floor of a building, and in all basements except those that are used only to house mechanical equipment which are less than 200 square feet in area. The 2012 IBC also contains some exceptions to this for rooms in buildings that are fully equipped with a fire sprinkler system, or for rooms that open directly to a corridor that leads to an exit in two directions.

The requirements for sizes, locations, etc., are set forth in Section 1029 of the 2012 IBC and Section R310 of the 2012 IRC. It is important to note that the required opening size of 24 inches high, 20 inches wide and 5.0 or 5.7 square feet in area must be met by "normal" operation of the window, door or skylight without the use of keys, tools or special knowledge, and without the removal of a second sash from the opening.

Typically the emergency escape and rescue opening requirements are met with operable windows or doors. Operable skylights and roof windows are also permitted to be used as emergency escape and rescue openings if they meet the size requirements and the bottom of their opening is within 44 inches of the floor below.

MINIMUM WINDOW-SILL HEIGHTS

The 2012 IBC and 2012 IRC require the bottom of openings created by operable windows to be a minimum height above the adjacent interior floor when they are more than 6 feet above the grade outside the window. In the 2012 IBC, the required height of that window sill above the adjacent interior floor is 36 inches. In the 2012 IRC, the required height is 24 inches.

Both codes include an exception for windows that do not open more than 4 inches or that are equipped with window guards that comply with ASTM F2006-10 or ASTM F2090-08 or window opening control devices (WOCDs) that comply with ASTM F2090-08. The WOCD must limit the initial opening of the window to no more than 4 inches, but must also be releasable with no more than 15 pounds of force to open more fully. The intent of this later provision is to permit windows that are equipped with WOCDs to also be used to meet the Emergency Escape and Rescue Opening requirements of the 2012 IBC and 2012 IRC.

MEANS OF EGRESS DOORS

Section R311.3 of the 2012 IRC and Section 1008.1.7 of the 2012 IBC restrict the threshold height of the required exit door in residences to 1½ inches or ¾ inch, depending upon the type of door, from the top of the threshold to the floor or landing on each side of the door. The rise from floor or landing to the top of the threshold at other exterior doors within the IRC, and for other exterior doors that are not required to be accessible or which do not provide access to a Type A or Type B unit within the IBC, is limited to 7¾ inches, which is the riser height permitted for stairs.

Section R311.3 of the 2012 IRC also specifies that the width of the clear opening provided by the required egress door is to be at least 32 inches when measured from the face of the door to the door stop at the jamb of the opening, and the height of the clear opening provided is to be a minimum of 78 inches when measured from the door stop at the head of the opening to the top of the threshold.

WINDOW INSTALLATION

Section R612.1 of the 2012 IRC requires that windows and doors be installed in accordance with the fenestration manufacturers' installation instructions and flashed in accordance with Section R703.8. Section 1405.4 of the 2012 IBC requires window openings to be flashed "in such a manner as to prevent moisture from entering the wall or to redirect it to the exterior."

Section R703.8 of the 2012 IRC gives more specific provisions for the installation of flashing around the window. It requires that flashing be installed in shingle-fashion in such a manner as to prevent entry of water into the wall cavity or penetration of water to the building structural framing components, and that the flashing is to extend to the surface of the exterior wall finish or to the water-resistive barrier for subsequent drainage.

The 2012 IRC also references an AAMA standard for self-adhered flashing. Section 703.8 of the 2012 IRC requires self-adhered membranes used as flashing to comply with AAMA 711-07.

SAFETY GLAZING

Section 2406.4 of the 2012 IBC and Section R308.4 of the 2012 IRC establish the locations where safety glazing is required. They include the following:

- Glazing in and near swinging and sliding doors;
- Large lites of glass near walkways;
- Glazing around tubs, showers, pools and similar fixtures;
- Glazing near stairways, ramps and the landings for both.

In these applications, the glazing must be labeled per the Consumer Product Safety Commission CPSC 16 CFR 1201 requirements. There are some exceptions for applications that are considered less hazardous, such as openings less than 3 inches in diameter in doors, decorative glass, and glazing provided with a protective bar, etc.

The previous exception for wired glass in fire-rated assemblies that complied with ANSI Z97.1 in other than educational-use groups has been removed. In the 2012 IBC, wired glass is only permitted in doors that meet CPSC 16 CFR 1201, just like any other type of glass. The 2012 IBC and IRC also permit the use of glass that meets the two most stringent categories of ANSI Z97.1 in hazardous locations that are defined within those codes, but which do not fall within the scope of the federal law established by CPSC 16 CFR 1201. These locations include tub and shower enclosures, door sidelites, large lites of glass, and glazing near stairs, ramps and pools.

The criteria for these two categories of ANSI Z97.1 are similar to CPSC 16 CFR 1201 for these applications, but ANSI Z97.1 was updated in 2009, while CPSC 16 CFR 1201 was last updated in 1977. Therefore ANSI Z97.1 is considered to be more up-to-date and consistent with products currently available than CPSC 16 CFR 1201.

The defined hazardous locations did not change significantly between the 2009 International Codes and the 2012 IBC and 2012 IRC.

MULLIONS

The 2012 IRC requires testing or structural calculations to demonstrate the ability of window mullions to meet certain structural requirements. If structural calculations are used to determine adequacy, the deflection of the mullions is limited to L/175 of the length of the long edge of the glass being supported.

If testing is the method used to determine structural adequacy of mullions, the testing is to be done in accordance with AAMA 450-09 Voluntary Performance Rating Method for Mulled Fenestration Assemblies. When the mullion is tested in accordance with AAMA 450-09, the deflection limit of L/175 does not need to be met. It should be noted that this provision is only contained in the IRC. As such, it is most commonly applied to R and LC windows and not HC or AW windows.

REPLACEMENT WINDOWS

As a general rule, when an addition is made to a building or a component within a building is replaced, the International Codes require the new component or addition to comply with the requirements of the current code for new construction. This is also true for replacement windows. Both the 2012 IECC and 2012 IRC require replacement windows to comply with the energy conservation requirements for fenestration in new construction. This requirement applies whether the entire window unit, including frame, sash and glazing, is being replaced, or just the sash and glazing.

SUNROOM ADDITIONS

The 2012 IECC permits glazing in thermally isolated sunrooms to have a maximum U-factor of 0.45 in climate zones 4 to 8. By definition, a thermally isolated sunroom must be separated from the remainder of the building by either existing exterior wall construction or construction that meets the energy efficiency requirements of the 2012 IRC for exterior walls. The sunroom must also be equipped with a separate heating or cooling system or thermostatically controlled as a separate zone, if conditioned. Previous editions of the IECC placed size restrictions on thermally isolated sunrooms but these restrictions do not occur in the 2012 IECC.

Sunrooms must be thermally isolated from the remainder of the home to take advantage of the higher permitted U-factor for fenestration. Under the 2012 IECC and 2012 IRC, sunrooms can be built as part of new construction, but they must still be thermally isolated from the remainder of the home, as discussed above, to use the U-factor of 0.50 rather than 0.35 in climate zones 5 to 8, or 0.40 in climate zone 4.

SITE-BUILT GLAZING

Chapter 24 of the 2012 IBC references ASTM E1300-07e01 for glass design. The 2007e01 edition of ASTM E 1300 addresses several types of glass layups and support combinations that were not addressed in previous editions of the standard. Having it referenced in the 2012 IBC greatly enhances the designer's options in terms of providing glazed openings that can meet all the requirements of the code, including energy efficiency and impact resistance.

A previous provision that requires glass to be designed by a registered design professional if the glass framing deflects more than L/175 or ¾ inch remains in the 2012 IBC. An exemption to this requirement continues to be given in Section 1710.5 of the 2012 IBC for exterior windows and doors that are tested and labeled in accordance with AAMA/ WDMA/ CSA 101/I.S.2/A440-11.

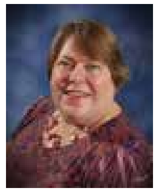
SKYLIGHTS AND SLOPED GLAZING

The 2012 IBC and 2012 IRC have different requirements for factory-built unit skylights than for other types of glazed assemblies in roofs such as skylights and sloped glazing. Factory-built unit skylights that contain only one panel of glazing material are required to be tested and labeled for performance grade in accordance with AAMA/WDMA/CSA 101/I.S.2/A440-11 in both the 2012 IBC and IRC. Section 2405.5 of the 2012 IBC establishes the required performance-grade rating based on the provisions of that code for wind, snow and dead loads.

As for vertical glass, glass in sloped glazing is to be designed in accordance with ASTM E 1300-07e01. The requirements for screening under skylights and sloped glazing, as set forth in Section 2405.3 of the 2012 IBC and Section R308.6.3 of the 2012 IRC, are consistent with previous editions of the International Codes. This includes requiring the screening to be securely fastened to the framing and to be able to support twice the dead weight of the glass. Requirements for curbs on skylights and sloped glazing, when applicable, is also consistent with those in the previous editions of the International Codes, and are set forth in Section 2405.4 of the 2012 IBC and Section R308.6.8 of the 2012 IRC.

CODE CYCLES

As noted at the outset, this article focuses on the requirements of the 2012 editions of the International Codes. Heading into 2014, most states and local jurisdictions are still referencing older editions of the IRC, IBC and IECC. Adoption and enforcement of a new edition of a model construction code traditionally occurs most significantly in the second and third year after its publication. Some states, however, have specifically opted to skip the 2012 edition of the International Codes and will continue to use the 2009 or earlier edition until the 2015 edition becomes available. We can expect to see continued adoption of the 2012 International Codes, however, by some jurisdictions in 2014 as other states complete the rather arduous process of putting an updated code into place.



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