CITY OF Bloomington ILLINOIS

Planning and Code Enforcement Department
115 E. Washington Street
P.O. Box 3157
Bloomington, Illinois 61702-3157

MEMO

To: Building Board of Appeals Member:
From: Mark R. Huber, Director, Planning and Code Enforcement
Date: December 12, 2013
Subject: Packet Contents

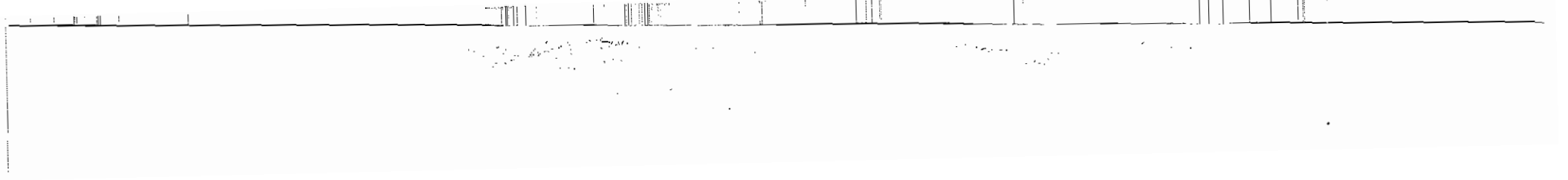
Please find enclosed in this packet of materials the following information:

1. A copy of the city ordinance that creates the Building Board of Appeals.
2. A copy of a list of the membership of the Board including addresses, phone numbers and emails.
3. An agenda of the Board meeting of December 19, 2013
4. A copy of the information being used as a basis for Case BBA-1-13, including a summary of code changes and related background information.

If you have any questions, please feel free to contact me at (309) 434-2446 or mhuber@cityblm.org

Respectfully,

Mark R. Huber
Director, Planning and Code Enforcement



City Code Creating the Building Board of Appeals and the Board's Function

Section 23 : Building Board of Appeals

1. There is hereby created a Building Board of Appeals consisting of nine members. The members of the Board shall be individuals who are qualified by experience and training to decide upon matters pertaining to building construction and shall have the specific qualifications of each discipline set forth in this Section. Three members shall represent general construction, and two members each shall represent the disciplines of mechanical construction, electrical construction and plumbing.

    a. General Construction: A general construction representative must be a licensed architect, licensed structural engineer, an individual having a minimum of a Master's degree in construction technology or related field, or an individual having a minimum of five years of experience in general construction.

    b. Mechanical Construction: A mechanical construction representative must be a licensed mechanical engineer or a licensed HVAC contractor with a minimum of five years of experience in HVAC installation and maintenance.

    c. Electrical Construction: An electrical construction representative must be a licensed electrical engineer or a licensed electrical contractor with a minimum of five years of experience in electrical installation and maintenance.

    d. Plumbing Construction: A plumbing construction representative must be a licensed plumber with a minimum of five years of experience in plumbing or an individual with a minimum of a Bachelor's Degree in environmental science.

2. The Mayor, with the consent of the City Council, shall make appointments to the Building Board of Appeals. The initial board shall consist of representatives appointed for staggered terms with three representatives each appointed to serve a two, three, or four-year term. Thereafter, members shall be appointed for terms of four years and shall serve until their successors are appointed and duly qualified. The Board shall designate one of its members to serve as Chairperson. The Chairperson shall serve a one year term and may be reappointed. The Director of Planning and Code Enforcement or his designee shall serve as an advisor to the Board and may act as its Secretary. Vacancies

among Board members shall be filled for the unexpired term in the same manner as original appointments.

3. The Building Board of Appeals shall have the following functions:

    a. To hear and decide all appeals from rulings or determinations made by the Director of Planning and Code Enforcement or department staff pursuant to this Chapter, Chapter 15, (the Electrical Code), or Chapter 34, (the Plumbing Code). In any appeal pertaining to general, mechanical, electrical or plumbing construction, at least one board member representing the discipline at issue must attend and participate in the appeal hearing and deliberations, unless such participation would be prohibited by law. In the event a board member from the discipline at issue is unavailable, the appeal shall be continued in an expeditious manner to a date upon which a representative from the discipline at issue and quorum of the board can be present.

    b. To hear appeals related to applications for HVAC and electrical contractor licenses. In any such appeal, at least one board member representing electrical construction must attend and participate in the appeal hearing and deliberations.

    c. To conduct hearings on revocation or suspension of licenses, or the levying of fines against licensees.

    d. To serve as the "Board of Appeals" as that term is used in the various International construction codes adopted by the City of Bloomington. All appeals of decisions and determinations made under the International Property Maintenance Code or Chapter 45 of this Code shall be heard and reviewed by the Property Maintenance Board of Review as provided in that Chapter.

    e. To examine and review background, general practical knowledge, prerequisites and qualifications required to sit for the practical examinations for electricians and mechanical contractors as required in this Chapter and Chapter 15 of this Code.

    f. To recommend to the City Council reasonable rules and regulations governing the issuance of permits by the Director of Planning and Code Enforcement under this Chapter.

    g. To recommend to the City Council reasonable fees to be paid for the inspections performed by personnel of the Planning and Code Enforcement Department of the City of Bloomington under this Chapter.

h. To perform such other duties as may be given or assigned by the City Council.

i. The Building Board of Appeals, in concurrence with the Director of Planning and Code Enforcement, shall have the authority to provide for experimental programs or pilot studies, including studies which would allow for the installation of materials or methods which are otherwise prohibited by City of Bloomington ordinance. In determining whether to approve such studies or pilot programs, the Building Board shall consider the health and safety of the residents of the City of Bloomington, the likely future use of the product or method sought to be used, and the expected benefit of the intended material or method. Any program or study approved shall be limited in duration and scope such that a reasonable assessment can be made of the material or method. The Director of Planning and Code Enforcement shall report regularly to the Building Board of Appeals on the effectiveness of such material or method approved for a pilot program or study.

4. Quorum. Five members of the Board shall constitute a quorum. All decisions shall require an affirmative vote of a simple majority of the Board members present. No member of the Board shall consider or vote on any question in which he, or any corporation, limited liability company, or other legal entity in which he is a shareholder, is financially interested to an extent greater than other persons, firms or corporations performing or in business to perform comparable work.

5. Meetings and Records. Meetings of the Board shall be held biannually, or at the call of the Chairperson or such other times as the Board may determine. All hearings before the Board shall be open to the public. The Board shall keep minutes of its proceedings, showing the vote of each member on every question. If a member is absent or fails to vote, the minutes shall so indicate. The Board shall also keep records of its other official actions. Such minutes and such records shall be public records.

6. Appeal Procedure.

   a. Application for Appeal. Any application for appeal shall be made within ten days from the date of the decision appealed from, by filing with the Director of Planning and Code Enforcement a Notice of Appeal specifying the grounds for the appeal. The Director of Planning and Code Enforcement shall transmit to the Board of Appeals the Notice of Appeal and all papers or documents on which the matter appealed from was based.

b. Any petition for a variance/interpretation from the Building Board of Appeals shall be filed with the Planning and Code Enforcement Department, accompanied by a fee of One Hundred Fifty Dollars, payable to the City of Bloomington. Each additional petition in a multiple petition shall be charged a fee of Thirty Dollars.

c. Decision of the Board of Appeals. The Board of Appeals shall in every case reach a decision without unreasonable or unnecessary delay. Every decision of the Board shall be in writing and shall promptly be filed in the office of the Director of Planning and Code Enforcement and served either by personal delivery or regular mail on the party initiating the appeal.

d. If a decision of the Board of Appeals reverses or modifies a decision of the Director of Planning and Code Enforcement, the Director of Planning and Code Enforcement shall take action immediately in accordance with such decision. The decision of the Board shall be final, subject only to judicial review.

7. Rules and Regulations. The Board may establish rules and regulations for its own procedure not inconsistent with the provisions of this Chapter. (Ordinance No. 2013-68)

CITY OF Bloomington ILLINOIS

Agenda
Building Board of Appeals
Council Chambers, City Hall, 109 E. Olive Street, Bloomington
December 19, 2013, 3:00 p.m.

I. Call to Order (Secretary)

II. Board Member Introductions and Election of a Chairman
   a. Introductory Statements – Mark Huber, Director of Planning and Code Enforcement (PACE)
   b. Election of the Chair

III. Purpose and Operations – Mark Huber, Director of PACE
   a. Meeting frequency
   b. Areas of expertise and attendance
   c. Introductions of Building Safety Staff

IV. Public Comment

V. Case # BBA-1-13 City of Bloomington Staff requesting a recommendation to the City Council concerning the adoption of the 2012 International Code Council (ICC) family of codes. Specifically, the:
   IBC, International Building Code
   IRC, International Residential Code
   IFC, International Fire Code
   IECC, International Energy Conservation Code
   IMC, International Mechanical Code
   IFGC, International Fuel Gas Code
   In addition the Board is being asked to consider the National Electrical Code, NEC/2014.

VI. Other business.

Respectfully submitted,

Mark R. Huber
Director, Planning and Code Enforcement

Planning and Code Enforcement Department
115 E. Washington Street
P.O. Box 3157
Bloomington, Illinois 61702-3157

Proposed Code Adoptions

In an effort to keep the City of Bloomington in conformance with the latest in national standards for the built environment, staff is proposing the adoption of the following updated codes. These codes and standards have been thoroughly reviewed on a national level and are considered to be the leaders in the industry.

NEC, National Electric Code 2014
IBC, International Building Code/2012
IRC, International Residential Code/2012
IFC, International Fire Code/2012
IECC, International Energy Conservation Code/2012
IFGC, International Fuel Gas Code/2012
IMC, International Mechanical Code/2012

SYNAPSIS of CHANGES

The following information is presented as a brief synapsis of the changes relevant to the local construction industry. It is not meant to be all inclusive but address those items that are most likely to affect local contractors and developers. The information is presented here in a brief statement format. More detailed information on each area has been provided as appendices. This additional information is drawn from various publications of the International Code Council (ICC) partially entitled, "Significant Changes to the (applicable code)"

International Residential Code (IRC)

There are very few substantial changes to the residential code in this cycle. Staff has removed the fire protection requirement from the code as it did in the 2009 edition. However, there is a new section (501.3) that provides for floor protection options in cases were sprinklers are not provided. The mandatory option section of the code has remained intact.

Applicable Code Section	Summary of Change
Section R310.1 Emergency Escape and Rescue Openings	Clarification on how to measure the sill height of an emergency escape and rescue opening. The measurement is taken from the finished floor to the bottom of the clear opening.
Section R310.2.2 Window Well Drainage	New requirement for egress window well to drain to the foundation drainage system.

Applicable Code Section	Summary of Change
Section R313 Automatic Fire Sprinkler Systems	Staff is deleting the requirement in the 2012 edition of the code to provide fire suppression systems in one and two family dwellings.
Section R302.5.1 Garage Opening Protection	Doors between the garage and the living space are now required to have a self-closing device.
Section R308.4.6 Glazing adjacent Stairs and Ramps and Section R308.4.7 Glazing adjacent to the Bottom Stair Landing.	Modification of the requirements for safety glazing around stairs and landings.
Section R315.2 Carbon Monoxide Detection Systems	This new section now recognizes carbon monoxide detection systems and provides where they are to be installed and maintained.
Section 405.1 Foundation Drainage	Requires footing tile to be protected by an approved filter membrane or protection of the rock cover by a filter membrane.
Section 501.3 Fire protection of floors	This requirement provides fire protection to unprotected floors in cases where fire protection has not been provided.
Sections 602.10 and 602.12 Wall Bracing	Rewritten and additional sections to make wall bracing easier to understand and apply.

International Building Code, IBC

As in the residential code, there are few substantive changes in the 2012 edition of the Building Code. There are many sections intended to provide clarification and more restrictive requirements for fire protection in specific instances.

Applicable Code Section	Summary of Change
Section 703.3 Identification of Fire and Smoke Separation Walls	Modification of the marking required above ceiling and accessible spaces to increase the potential for such markings to be seen.
706.2 Double Fire Walls	Allows for the use of NFPA 221 double fire wall as an alternative to single wall construction.
707.8, 707.9 Intersections of Fire Barriers at Roof Assemblies	Allows the void at the intersection of a fire barrier and a nonfire-resistive roof assembly to be protected with an approved material.
712 Vertical Openings	A new emphasis on the presence of vertical openings rather than shaft enclosures.
716.3, 202 Marking for Fire-Rated Glazing Assemblies	A new table has been added to define and regulate the various test standards for fire-rated glazing, including the designations used to mark such glazing.
Table 716.6	Adds identification of the markings required on the fire-rated glazing for acceptance in specified applications.

Applicable Code Section	Summary of Change
716.6.4 Wired Glass in Fire Window Assemblies	The allowance for the use of wired glass without compliance with the appropriate test standards has been eliminated.
804.4 Interior Floor Finish Requirements	Floor finishes in rooms or spaces that are not separated from a corridor with full-height walls must meet the same requirement as the corridor.
903.2.4, 903.2.7, 903.2.9 Furniture Storage and Display in F-1, M and S-1 Occupancies	Automatic sprinkler systems are now required in occupancies where upholstered furniture or mattresses are manufactured, stored, or displayed.
903.2.11.1.3 Sprinkler Protection for Basements	Obstructions in basements that block hose streams now will require sprinklers.
907.2.11.3 Wireless Interconnection of Smoke Alarms	Smoke alarms are now required in use group I-1 occupancies and an allowance is being made for wireless smoke detectors.
908.7 Carbon Monoxide Alarms	CO alarms are now required in R and I occupancies with fuel fired appliances or attached garages.
1005 Means of Egress Capacity Determination	Reduced exit factors have been established for buildings with sprinklers and voice/alarm communication systems.
1008.1.2 Door Swing	Design occupant load of a space shall be used to determine door swing – not the load per door.
1009, 1010, and 202 Interior Stairways and Ramps	Revisions have been made throughout the code to coordinate the provisions for unenclosed interior stairways and ramps that can be used as a portion of the means of egress.
1012 Handrail Height	Transition pieces of a continuous handrail are now permitted to exceed the maximum permitted handrail height.
1012.3.1 & 1012.8 Handrail graspability and Projections	A minimum cross-section dimension has now been established for the graspability of noncircular Type I handrails.
1013.1 and 1013.8 Guards at Operable Windows	Requirements have been relocated in the code and height requiring protection has been modified from 24 to 36 inches.
1013.3 Guard Height	Heights have been reduced to 36 inches in R-3 and within units of R-2 uses.
1021.2.3 and Table 1021.2(1) Exits from Dwelling Units	Clarification of when a single exit is allowed from an individual dwelling unit.
Table 1607.1 Minimum Live Loads	Coordinates live load requirements with ASCE 7-10.
1609 and 202 Determination of Wind Loads	Coordinates with the latest wind load provisions in ASCE/SEI 7 (ASCE 7-10).
2406.1 and 2406.4 Safety Glazing – Hazardous Locations	Reorganization and clarification in order to provide better consistency between the IRC and IBC.

International Mechanical and Fuel Gas Codes

Applicable Code Section	Summary of Change
306.5 Equipment and Appliances on Roofs or Elevated Structures	Clarifies permanent access requirements for equipment above grade.
506.3.11.2 Field-Applied Grease Duct Enclosures	Field-applied grease duct enclosure systems are now prohibited from being used to reduce clearance to combustibles.
507.2.1 Type I Hoods	Type I hoods are no longer required to be installed where complying electric cooking appliances are being used.
507.2.2 Type II Hoods	Type II hoods are now required to be installed above all appliances that produce products of combustion but do not produce grease or smoke.
805.3 Factory-Built Chimney Offsets	The minimum offset in a factory-built chimney is now specified and the number of offsets has been limited.

International Fire Code

The fire code primarily provides additional occupancy specific standards for the building code. The following are just a few new issues that might be of interest to the local market.

Applicable Code Section	Summary of Changes
610 Commercial Kitchen Cooking Oil Storage	A new section on the classification (Class IIIB liquid) and storage of commercial cooking oil in kitchens.
5705.5 Alcohol-Based Hand Rubs Classified as I or II liquids	Requirements for touch-free alcohol-based had rubs have now been included in the IFC.
6104.3.1 Installation on Roof Prohibited	New section that prohibits the installation of stationary LP tanks on the roofs of buildings.
6109.15 LP-Gas Cylinder Exchange for Resale	New requirements regulating the design, operation, and maintenance of automated cylinder exchange stations and the LP-gas exchange cabinets accessible the public.

International Existing Building Code

There is one substantial change to the IEBC and it is more editorial than code related. The four compliance methods currently scattered throughout the code have been brought into a single new Chapter 3, Compliance Methods. A second part of that chapter is devoted to seismic designs and criteria. However, due to the geographic location of the City of Bloomington, it has little or no application.

International Energy Conservation Code

The proposed adoption of the International Energy Conservation code is primarily to assist in the enforcement of the standard already required by State Law. As a State mandate we are unable to affect any changes to the code but must enforce as adopted. The following are changes mostly applicable to residential construction.

Commercial requirements are left to the design professional of record to include with their construction documents and the commissioning requirement.

The primary emphasis in the residential portion of the 2012 code is on the building envelope. This can be seen in the increase in R-values, decrease in U-values, and tougher testing requirements (i.e. mandatory blower door test).

Applicable Code Section	Summary of Changes
Table R402.1.1 R-Value Computation for Building Thermal Envelope	Of particular note should be the increase in R-values of ceilings (R-38 to R-49) and foot note h where the compressed value of insulation is provided.
R402.4.1 and R402.4.2 Building Thermal Envelope and Testing	These sections provide the criteria for inspection and testing (blower door) of the building envelope. It should be noted that in most, if not all, cases, mechanical ventilation will be required in houses that meet the air tightness requirements.
R403.2 Duct construction and Sealing	Primarily requires all duct work to be sealed in accordance with the code and prohibits the use of framing cavities for plenums.
R403.2 Duct Tightness Verification	Generally required duct tightness to be leak tested. Note the test is not required if the ductwork is entirely located in the thermal envelope of the building.
R403.5 Mechanical Ventilation	New requirement to provide mechanical ventilation to the HVAC system.
R404.1 Lighting Equipment	Establishes a minimum of 75% of light fixtures to use high-efficacy lamp and eliminates the use of standing pilot lights in fuel fired equipment.

National Electrical Code

The most practical changes in the new electrical code are the expanded requirements for GFCI and AFCI devices.

Applicable Code Section	Summary of Changes
110.26(C)(3) Personnel Doors	The provisions for entrance/egress doors into work spaces have been reduced from 1200 to 800 amperes.
110.26 Space About Electrical Equipment	Dedicated equipment space is now required for both outdoor installations and for indoor installations.
210.8 Ground-Fault Circuit Interrupter protection for personnel.	GFCI protection is required within six feet of all dwelling unit sinks (including kitchen sinks)
210.8(A)(10) Ground-Fault Protection in Laundry areas	All dwelling unit laundry areas now require GRCI protection for 125-volt, single phase 15 and 20 ampere receptacles, regardless of the presence of a sink or the distance from the same.

Applicable Code Section	Summary of Changes
210.8(D) Ground-Fault Protection for Dishwashers	GFCI Protection is now required for all outlet that supply dishwashers installed in dwelling units.
210.12(A) AFCI Protection	Kitchens and laundry areas were added to the list of areas requiring AFCI protection. AFCI protection was also expanded from outlets only to outlets or devices, which would now include switches, etc.
210.12(C) AFCI Protection, Dormitory Units.	Dormitory units will now require AFCI protection.
210.52(G)(1) Dwelling Unit Garages	Receptacle provisions for basements, garages, and accessory buildings were revised into a list format. A branch circuit supplying garage receptacles is to supply only the garage. Receptacles are required for each car space in a garage.
Article 393 Low-Voltage Suspended Ceiling Power Distribution Systems	A new section added to address low-voltage Class 2 equipment connected to ceiling grids and wall constructed for this purpose.
406.9(B)(1) Receptacles in Damp or Wet Locations	Extra duty covers are now required of all 15- and 20-ampere, 125- and 250- volt receptacles installed in a wet location (not just those supported from grade). This requirement also includes dwelling unit wet location receptacles as well.

Appendix

R302.5.1

Garage Opening Protection

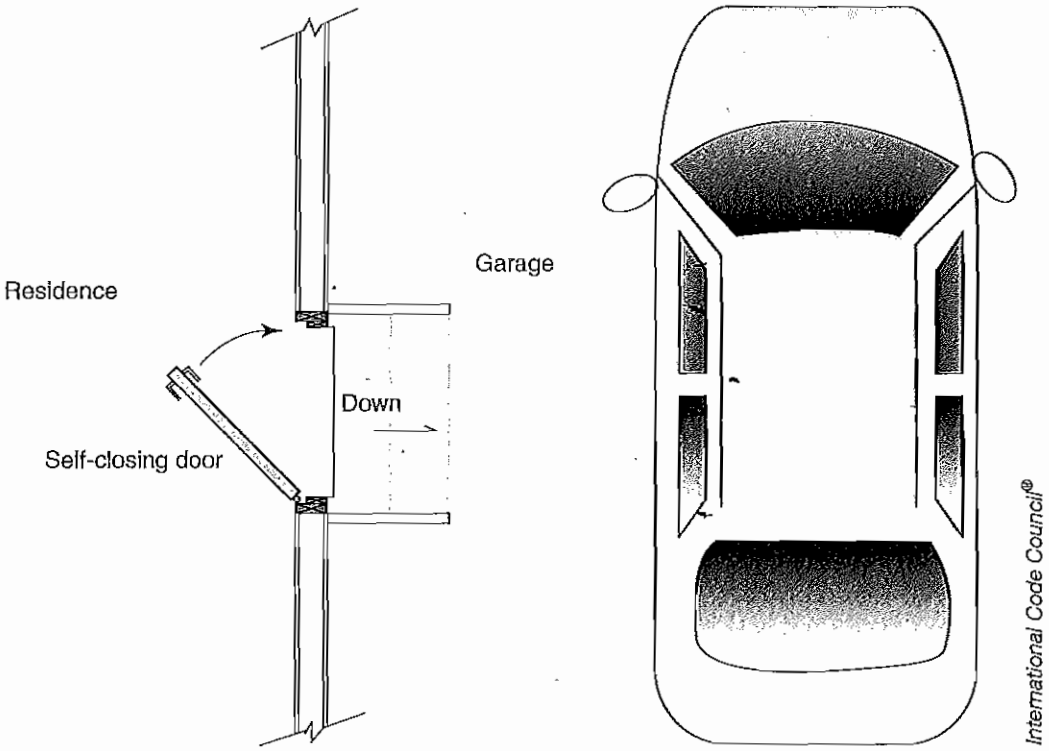
CHANGE TYPE: Modification

CHANGE SUMMARY: Doors between the garage and dwelling unit now require self-closing devices.

2012 CODE: R302.5.1 Opening Protection. Openings from a private garage directly into a room used for sleeping purposes shall not be permitted. Other openings between the garage and residence shall be equipped with solid wood doors not less than 1⅜ inches (35 mm) in thickness, solid or honeycomb core steel doors not less than 1⅜-inches (35 mm) thick, or 20-minute fire-rated doors, equipped with a self-closing device.

CHANGE SIGNIFICANCE: The IRC has always required a minimum level of separation between a dwelling unit and an attached garage to provide some resistance to the spread of fire from the garage side. Typically, this requirement is satisfied with the application of regular ½-inch gypsum board on the garage side of the separation. A fire-resistant-rated wall or floor assembly is not required for this separation. Likewise, the code prescribes the minimum thickness and construction of any door that passes from the garage to the residence, but does not require a fire-resistant-rated door assembly. That is, only the door slab must meet the construction specifications, and the frame and hardware are not evaluated for fire resistance. New to the 2012 IRC, doors from the garage to the residence now require self-closing devices. These may be spring-loaded hinges, automatic closers, or other approved devices.

R302.5.1 continues



The door between a house and a garage is required to be self-closing.

R302.5.1 continued

This new requirement intends to address concerns related to increased fuel loads and fire hazards located in a garage, toxic combnstion by-products of fires originating in the garage, and elevated levels of carbon monoxide from the exhaust of vehicles operating in a garage. Functional self-closing devices assist in maintaining the door in a closed position when not in use and intend to help prevent the spread of fire or toxic gases from the garage to the dwelling unit. Proponents of this change did not consider the code-prescribed smoke alarms and carbon monoxide detectors in the dwelling unit as adequate safeguards to address these concerns and expected that the lack of self-closing devices contributed to doors frequently remaining open between the garage and residence, thereby creating a potential hazardous condition.

R308.4

Hazardous Locations for Glazing

CHANGE TYPE: Clarification

CHANGE SUMMARY: The provisions for hazardous locations related to the installation of glazing have been reorganized for ease of use and consistent application. Each item in the numbered list of hazardons locations has been placed in a separate subsection and given a descriptive title.

2012 CODE: R308.4 Hazardous Locations. The ~~following~~ locations specified in Sections R308.4.1 through R308.4.7 shall be considered specific hazardous locations for the purposes of glazing.

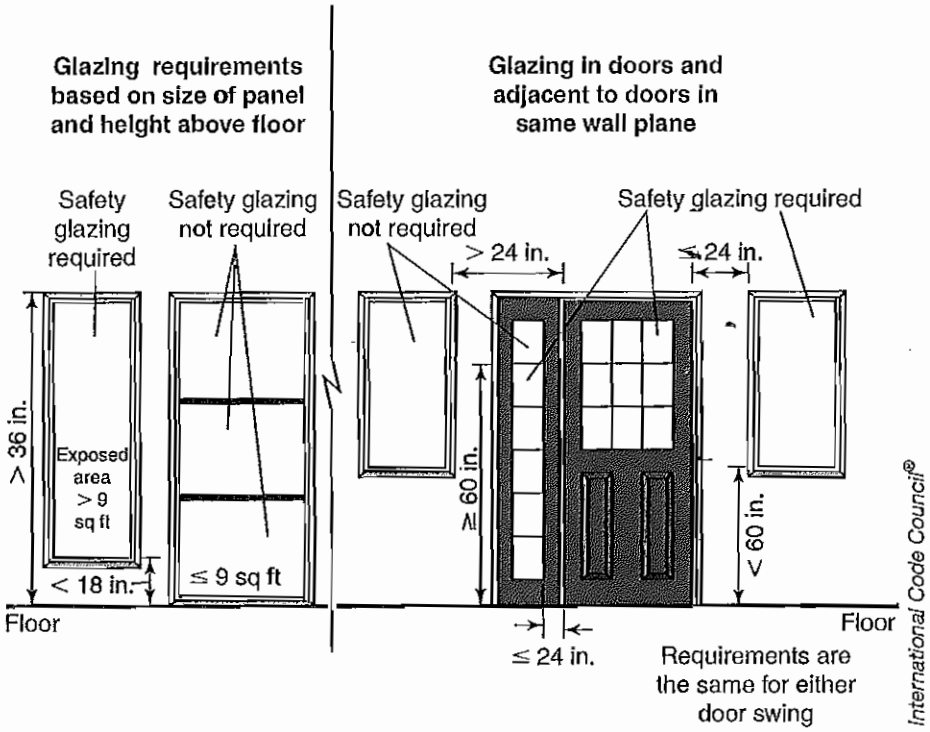
~~1.~~ **R308.4.1 Glazing in Doors.** Glazing in all fixed and operable panels of swinging, sliding, and bifold doors shall be considered a hazardons location.

Exceptions:

1. Glazed openings of a size through which a 3-inch diameter (76 mm) sphere is unable to pass.
2. Decorative glazing.

~~2.~~ **R308.4.2 Glazing Adjacent Doors.** Glazing in an individual fixed or operable panel adjacent to a door where the nearest vertical edge of the glazing is within a 24-inch (610 mm) arc of either vertical edge of the door in a closed position and ~~whose~~ where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) above the floor or walking surface shall be considered a hazardons location.

R308.4 continues



Safety glazing locations

R308.4 continued

Exceptions:

1. Decorative glazing.
2. When there is an intervening wall or other permanent barrier between the door and the glazing.
3. Glazing in walls on the latch side of and perpendicular to the plane of the door in a closed position.
4. ~~Glazing adjacent to a door where~~ Where access through the door is to a closet or storage area 3 feet (914 mm) or less in depth. Glazing in this application shall comply with Section R308.4.3.
5. Glazing that is adjacent to the fixed panel of patio doors.

~~3.~~ **R308.4.3 Glazing in Windows.** Glazing in an individual fixed or operable panel that meets all of the following conditions shall be considered a hazardous location:

~~3.1.~~ 1. The exposed area of an individual pane is larger than 9 square feet (0.836 m^2); and

~~3.2.~~ 2. The bottom edge of the glazing is less than 18 inches (457 mm) above the floor; and

~~3.3.~~ 3. The top edge of the glazing is more than 36 inches (914 mm) above the floor; and

~~3.4.~~ 4. One or more walking surfaces are within 36 inches (914 mm), measured horizontally and in a straight line, of the glazing.

Exceptions:

1. Decorative glazing.
2. When a horizontal rail is installed on the accessible side(s) of the glazing 34 to 38 inches (864 to 965) above the walking surface. The rail shall be capable of withstanding a horizontal load of 50 pounds per linear foot (730 N/m) without contacting the glass and be a minimum of 1½ inches (38 mm) in cross sectional height.
3. Outboard panes in insulating glass units and other multiple glazed panels 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.

~~4.~~ **R308.4.4 Glazing in Guards and Railings.** ~~All glazing~~ Glazing in guards and railings, ~~regardless of area or height above a walking surface. Included are~~ including structural baluster panels and nonstructural in-fill panels, regardless of area or height above a walking surface shall be considered a hazardous location.

CHANGE SIGNIFICANCE: Reorganization of the safety glazing requirements results in provisions that are more user-friendly and intends to promote consistency in their application. Each hazardous location now has its own subsection number and title, making the applicable requirement easier to locate. Revisions to the text eliminate conflicts and ambiguous language, and bring the IRC provisions into agreement with the corresponding requirements of the IBC.

R308.4.7

Glazing Adjacent to the Bottom Stair Landing

CHANGE TYPE: Modification

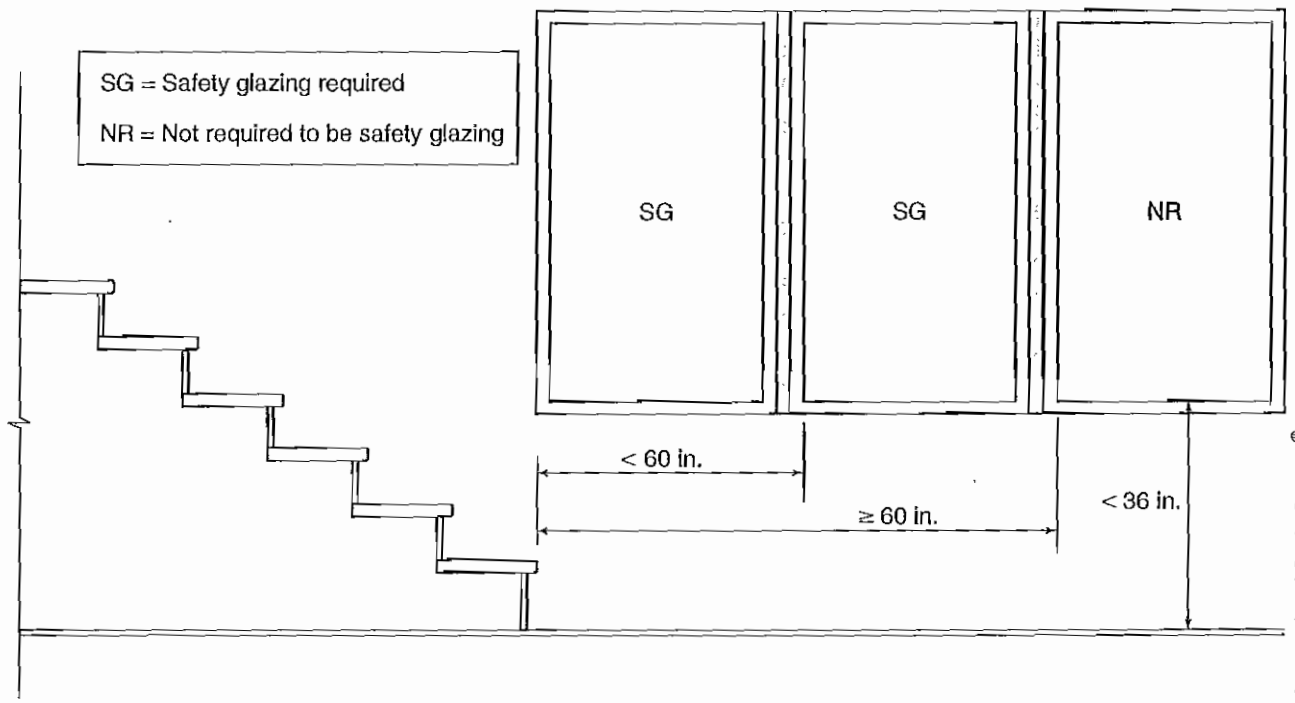
CHANGE SUMMARY: The provisions for glazing installed near the landing at the bottom of a stairway have been revised to clarify the application. The threshold for the minimum height above the walking surface is now 36 inches for determining that the glazing is not in a hazardous location.

2012 CODE: ~~8.~~ **R308.4.7 Glazing Adjacent to the Bottom Stair Landing.** Glazing adjacent to ~~stairways within 60 inches (1524 mm) horizontally of the bottom tread of a stairway in any direction when the exposed surface of~~ the landing at the bottom of a stairway where the glazing is less than ~~60~~ 36 inches (~~1524~~ 914 mm) above the ~~nose of the tread~~ landing and within 60 inches (1524 mm) horizontally of the bottom tread shall be considered a hazardous location.

Exceptions: The glazing is protected by a guard complying with Section R312 and the plane of the glass is more than 18 inches (457 mm) from the guard.

~~1. The side of the stairway has a guardrail or handrail, including balusters or in-fill panels, complying with Sections R311.7.6 and R312 and the plane of the glass is more than 18 inches (457 mm) from the railing; or~~

~~2. When a solid wall or panel extends from the plane of the adjacent walking surface to 34 inches (864 mm) to 36 inches (914 mm) above the walking surface and the construction at the top of that wall or panel is capable of withstanding the same horizontal load as a guard.~~



Glazing adjacent to the bottom landing of a stairway.

CHANGE SIGNIFICANCE: In residential occupancies, the greatest risk for a fall into glazing causing injury occurs at the bottom of stairways, and the code has always defined the locations adjacent to bottom landings as hazardous locations. These provisions have undergone modification to clarify their intent and application, and provide consistency with the other safety glazing provisions. Item 8 in the list of hazardons locations related to glazing becomes Subsection R308.4.7 in the 2012 IRC. The title of this subsection clarifies that it is glazing adjacent to the bottom landing that is being regulated, not glazing adjacent to the stairway. Similar to the stairway provisions in the previous item, the exception is more appropriately located in the main rule of this subsection. Previously, the rule stated that the glazing (other than safety glazing) required installation at least 60 inches above the walking surface. Exception 2 to the rule allowed installations less than 60 inches above the walking surface without requiring safety glazing provided a solid wall or panel protected the glazing to a height of 34 to 36 inches. The intent was that a window installed in a wall with the bottom exposed edge of the glazing at least 34 inches above the walking surface was not considered to be in a hazardous location. Because the standard installation is a window that is installed in a wall, the exception becomes the rule for the 2012 edition of the IRC. The references to stairways in Subsection R308.4.7 (previously item 8) have been deleted. Subsection R308.4.6 contains information related to glazing near stairways, and it was not thought necessary to repeat the requirements in the subsequent subsection. The previous range of 34 to 36 inches shown in the exception intended to correspond to the minimum heights of handrails and guards, respectively, but implied to some that there was a maximum height limit. A range of dimensions is confusing in this case, and the code now sets a minimum height of 36 inches to correspond to the guard requirements. Therefore, where the bottom exposed edge of the glazing adjacent to the landing is less than 36 inches above the walking surface and the glazing is within 60 inches of the bottom stair nosing, it is considered a hazardous location and safety glazing is required. Conversely, satisfying either of the following conditions means the glazing at the bottom landing is not considered to be in a hazardous location and therefore does not require safety glazing:

- The bottom exposed edge of the glazing is 36 inches or greater above the walking surface.
- The glazing is greater than 60 inches from the nosing of the bottom tread of the stairway measured horizontally.

The modified provisions for glazing near a bottom landing differ from those for glazing adjacent to stairways in one significant way. Glazing adjacent a stairway that is less than 36 inches above the tread may be protected by a single rail meeting the prescribed load and dimension requirements or be protected by a guard. When so protected, the glazing is not considered to be in a hazardous location and does not require safety glazing. This exception does not apply to glazing near a bottom landing. To eliminate the need for safety glazing requires both a guard and a horizontal clearance of 18 inches between the guard and the glazing. The 18-inch requirement has been deleted from the provisions related to glazing at the side of a stairway.

Revision of these provisions clarifies the meaning, provides objectively measurable dimensions, and brings consistency to the application of glazing requirements in the vicinity of the landing at the bottom of stairways.

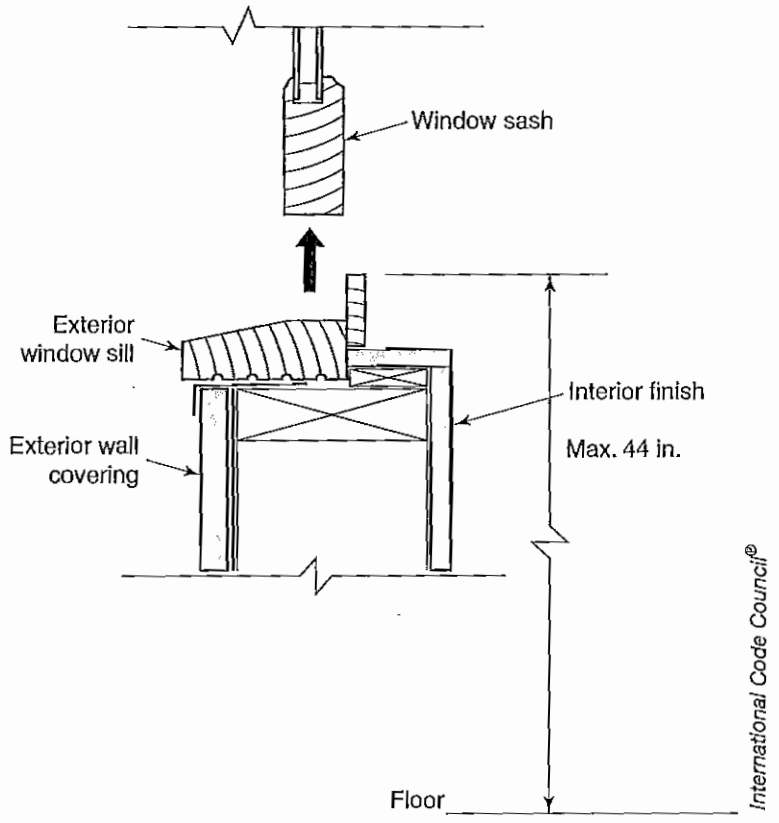
R310.1

Emergency Escape and Rescue Openings

CHANGE TYPE: Clarification

CHANGE SUMMARY: The maximum sill height for an emergency escape and rescue opening is now measured from the finished floor to the bottom of the clear openiug.

2012 CODE: R310.1 Emergency Escape and Rescue Required. Basements, habitable attics aud every sleeping room shall have at least one operable emergency escape and rescue opening. Where basements contain one or more sleeping rooms, emergency egress and rescue openings shall be required in each sleeping room. Where emergency escape and rescue openings are provided they shall have a sill height of not more than 44 inches (1118 mm) measured from the finished floor to the bottom of the clear opening ~~above the floor~~. Where a door opening having a threshold below the adjacent ground elevation serves as an emergency escape and rescue opening and is provided with a bulkhead enclosure, the bulkhead enclosure shall comply with Section R310.3. The net clear opening dimensions required by this section shall be obtained by the normal operation of the emergency escape and rescue opening from the inside. Emergency escape and rescue openings with a finished sill height below the adjacent ground elevation shall be provided with a window well in accordance with Section R310.2. Emergency escape and rescue openings shall open directly into a public way, or to a yard or court that opens to a public way.

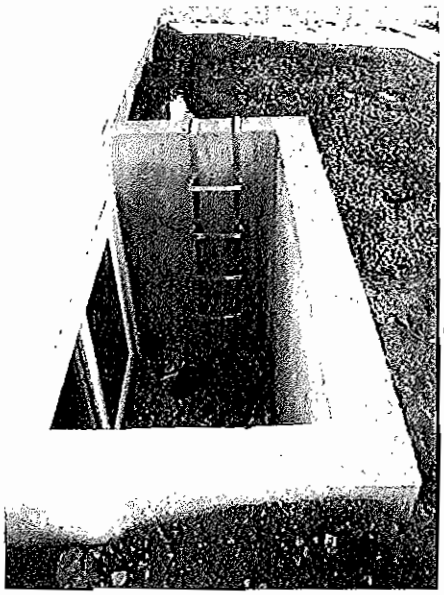


The maximum sill height for emergency escape and rescue openings is measured from the floor to the bottom of the clear opening.

CHANGE SIGNIFICANCE: The IRC is now more specific in describing the method for measuring the maximum sill height of an emergency escape and rescue opening. The maximum height remains unchanged at 44 inches and typically is only of concern when a window is serving this function, rather than a door, and typically in a basement installation. Previously, the measurement was taken from the floor to the top of the window sill. Not all window installations have a sill in the traditional sense of the word, and the measurement has been taken to any flat surface at the base of the window, whether it was finish drywall, trim, or an extension of the window frame. In some cases, windows have a stop, channel, or weather strip that extends above the surface of the sill, though this extension rarely exceeds ½ inch. The previous language was considered ambiguous and was perceived as causing inconsistency in the application of the code provision. The new language clearly prescribes the method of measurement from the finished floor to the bottom of the clear opening and intends to offer a higher level of precision in verifying compliance with this code provision. In the case of a stop or extension above the sill, the measurement is taken to the top of the stop or extension.

R310.2.2

Window Well Drainage



A window well serving an emergency escape and rescue opening requires provisions for drainage.

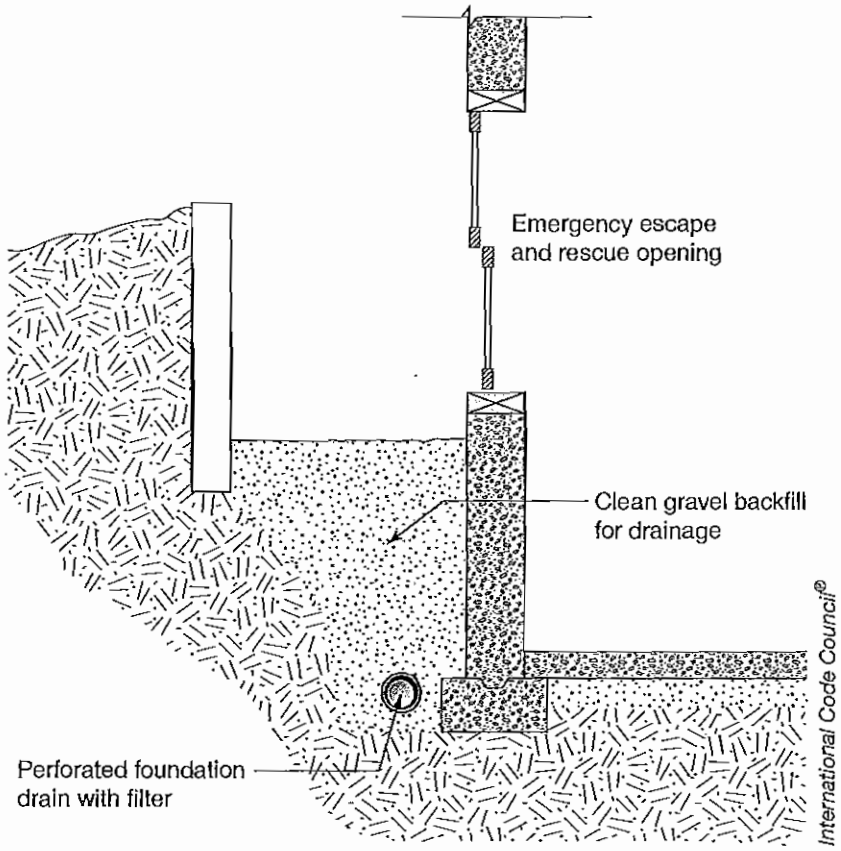
CHANGE TYPE: Addition

CHANGE SUMMARY: Except for locations with well-drained soils, window wells serving emergency escape and rescue openings now require a means to drain surface water to the foundation drainage system.

2012 CODE: R310.2.2 Drainage. Window wells shall be designed for proper drainage by connecting to the building's fonndation drainage system required by Section R405.1 or by an approved alternate method.

> **Exception:** A drainage system for window wells is not required when the foundation is on well-drained soil or sand-gravel mixture soils according to the United Soil Classification System, Group I Soils, as detailed in Table R405.1.

CHANGE SIGNIFICANCE: Depending on climate and soil conditions, window wells may retain significant amounts of water with the potential to damage building components, inclnding sheathing, siding, framing, and windows. Saturation and flooding of a window well also may cause water intrusion into concealed or living spaces of the home, causing property damage or au unhealthy living environment. Unless the ground consists of well-drained soils or a sand-gravel mixture, Section R310 now requires window wells serving emergency escape and rescue openings to be designed to direct surface water to the foundation drainage system.



Drainage for a window well serving an emergency escape and rescue opening.

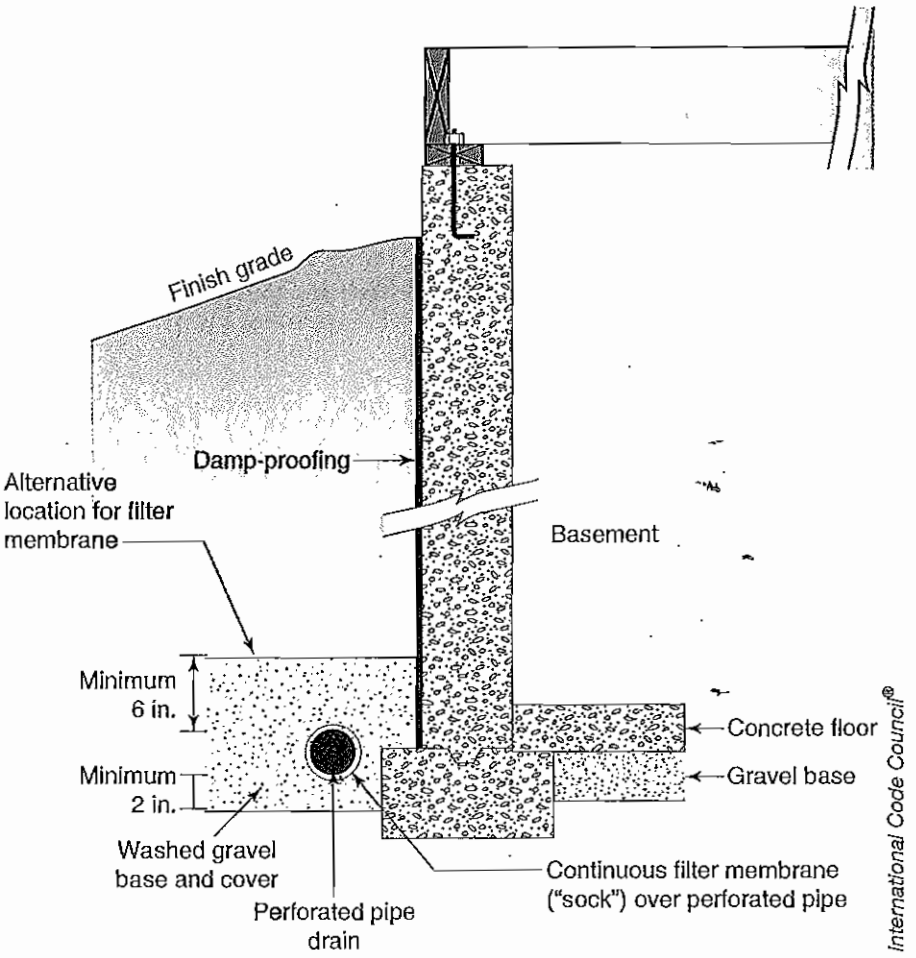
R405.1
Foundation Drainage

CHANGE TYPE: Modification

CHANGE SUMMARY: A filter membrane is now required for perforated foundation drains.

2012 CODE: R405.1 Concrete or Masonry Foundations. Drains shall be provided around all concrete or masonry foundations that retain earth and enclose habitable or usable spaces located below grade. Drainage tiles, gravel or crushed stone drains, perforated pipe or other approved systems or materials shall be installed at or below the area to be protected and shall discharge by gravity or mechanical means into an approved drainage system. Gravel or crushed stone drains shall extend at least 1 foot (305 mm) beyond the outside edge of the footing and 6 inches (152 mm) above the top of the footing and be covered with an approved filter membrane material. The top of open joints of drain tiles shall be protected with strips of building paper,. Perforated drains shall be surronnded with an approved filter membrane or the filter membrane shall cover the washed gravel or crushed rock covering the drain. ~~and the d~~ Drainage tiles or perforated pipe shall be placed on a minimum of

R405.1 continues



Filter membrane required for perforated pipe foundation drain.

R405.1 continued

2 inches (51 mm) of washed gravel or crushed rock at least one sieve size larger than the tile joint opening or perforation and covered with not less than 6 inches (152 mm) of the same material.

Exception: A drainage system is not required when the foundation is installed on well-drained ground or sand-gravel mixture soils according to the Unified Soil Classification System, Group I Soils, as detailed in Table R405.1.

CHANGE SIGNIFICANCE: Adequate foundation drainage prevents water intrusion and damage to below-grade spaces in dwellings, typically basements, which are often used as living space. The code requires foundation drainage to discharge to an approved drainage system. To function properly, drain pipe must remain reasonably free of silt and fine debris that may slow or stop the effective flow of ground water in the system. Continuous perforated plastic drain piping is a common material used for foundation drainage systems. For an added measure of protection against introduction of fine debris into the pipe, the code now requires this type of drain pipe to be surrounded with an approved filter material, often referred to in the industry as a sock. As an alternative, the approved filter membrane material may be placed to cover the required washed gravel or crushed rock placed over the perforated drain pipe, similar to the provision for gravel or crushed stone drains.

R501.3

Fire Protection of Floors

CHANGE TYPE: Addition

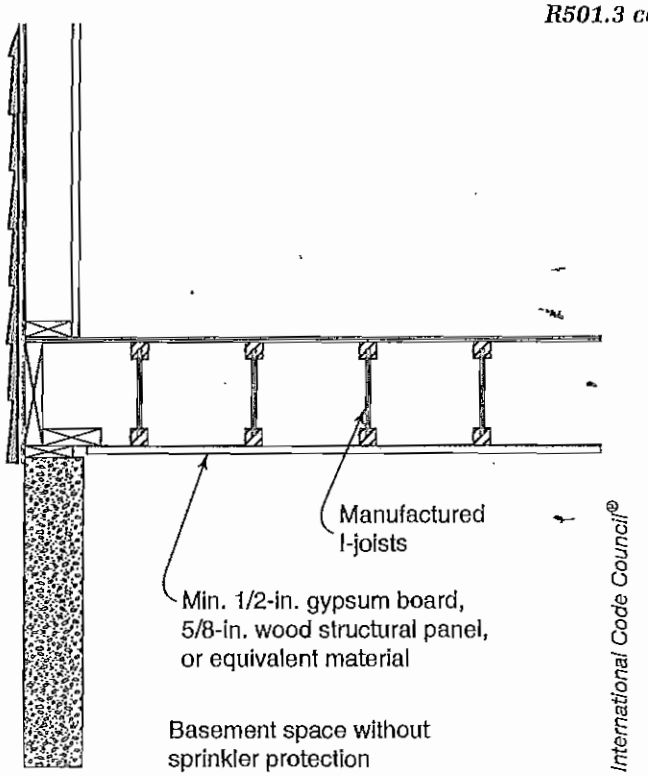
CHANGE SUMMARY: With some exceptions, the code now requires ½-inch gypsum board or equivalent material to be applied to the underside of floor assemblies in buildings regulated by the IRC.

2012 CODE: R501.3 Fire Protection of Floors. Floor assemblies, not required elsewhere in this code to be fire resistance rated, shall be provided with a ½-inch gypsum wallboard membrane, ⅝-inch wood structural panel membrane, or equivalent on the underside of the floor framing member.

Exceptions:

1. Floor assemblies located directly over a space protected by an automatic sprinkler system in accordance with Section P2904, NFPA13D, or other approved equivalent sprinkler system.
2. Floor assemblies located directly over a crawl space not intended for storage or fuel-fired appliances.
3. Portions of floor assemblies can be unprotected when complying with the following:
   - 3.1 The aggregate area of the unprotected portions shall not exceed 80 square feet per story
   - 3.2 Fire blocking in accordance with Section R302.11.1 shall be installed along the perimeter of the unprotected portion to separate the unprotected portion from the remainder of the floor assembly.

R501.3 continues



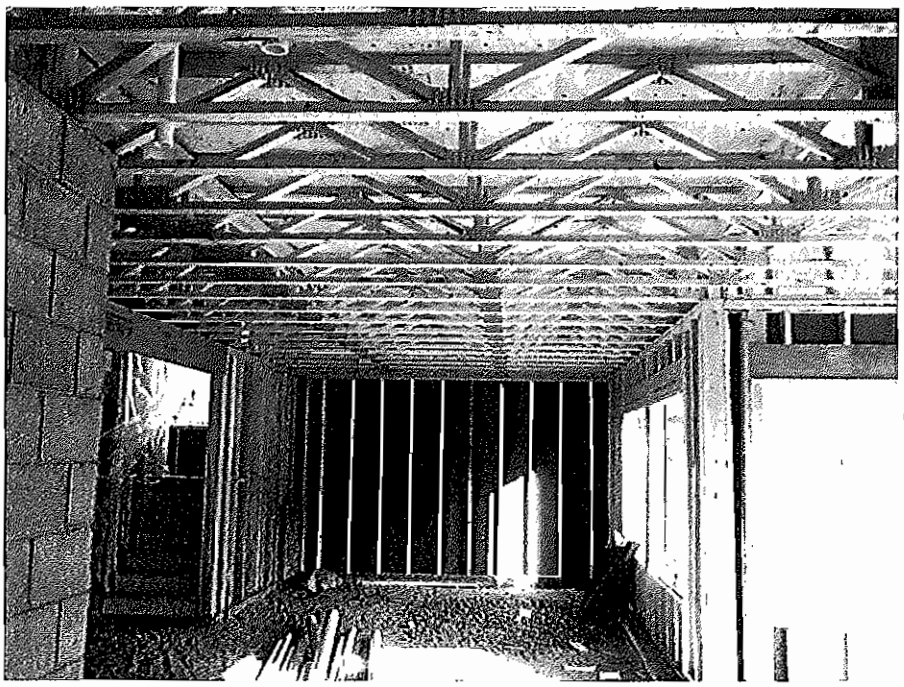
Fire protection of floors

R501.3 continued

4. Wood floor assemblies using dimension lumber or structural composite lumber equal to or greater than 2-inch by 10-inch nominal dimension, or other approved floor assemblies demonstrating equivalent fire performance.

CHANGE SIGNIFICANCE: Installation of ½-inch gypsum board, ⅝-inch wood structural panel, or other approved material is now required on the underside of floor assemblies of dwelling units and accessory buildings constructed under the IRC. The change addresses concerns for firefighter safety and incidents of injury or death to firefighters while fighting residential fires due to the collapse of floors. The application of gypsum wallboard or other approved material intends to provide some protection to the floor system against the effects of fire and delay collapse of the floor. This provision primarily is aimed at light-frame construction consisting of I-joists, manufactured floor trusses, cold-formed steel framing, and other materials and manufactured products considered most susceptible to collapse in a fire.

There are a number of exceptions to this new rule. Solid-sawn lumber and structural composite lumber perform fairly well in retaining adequate strength under fire conditions. Therefore, floors framed with nominal 2 x 10s or larger of these materials are exempt from this section's fire protection requirements. Similarly, if sprinklers are installed to protect the space below the floor assembly, additional protection is not required. Crawlspaces without storage or fuel-fired appliances are not considered to contain sufficient fuel load to present an undue hazard to floor collapse. The code also exempts small areas of ceiling, such as may occur in a utility room in a basement, from the fire protection requirements, provided the space is not open to other portions of the floor system. Therefore, fireblocking is required to isolate the unprotected area from the protected area of the floor system.



International Code Council®

Open web floor trusses require a fire protection membrane applied to the underside.

CHANGE TYPE: Modification

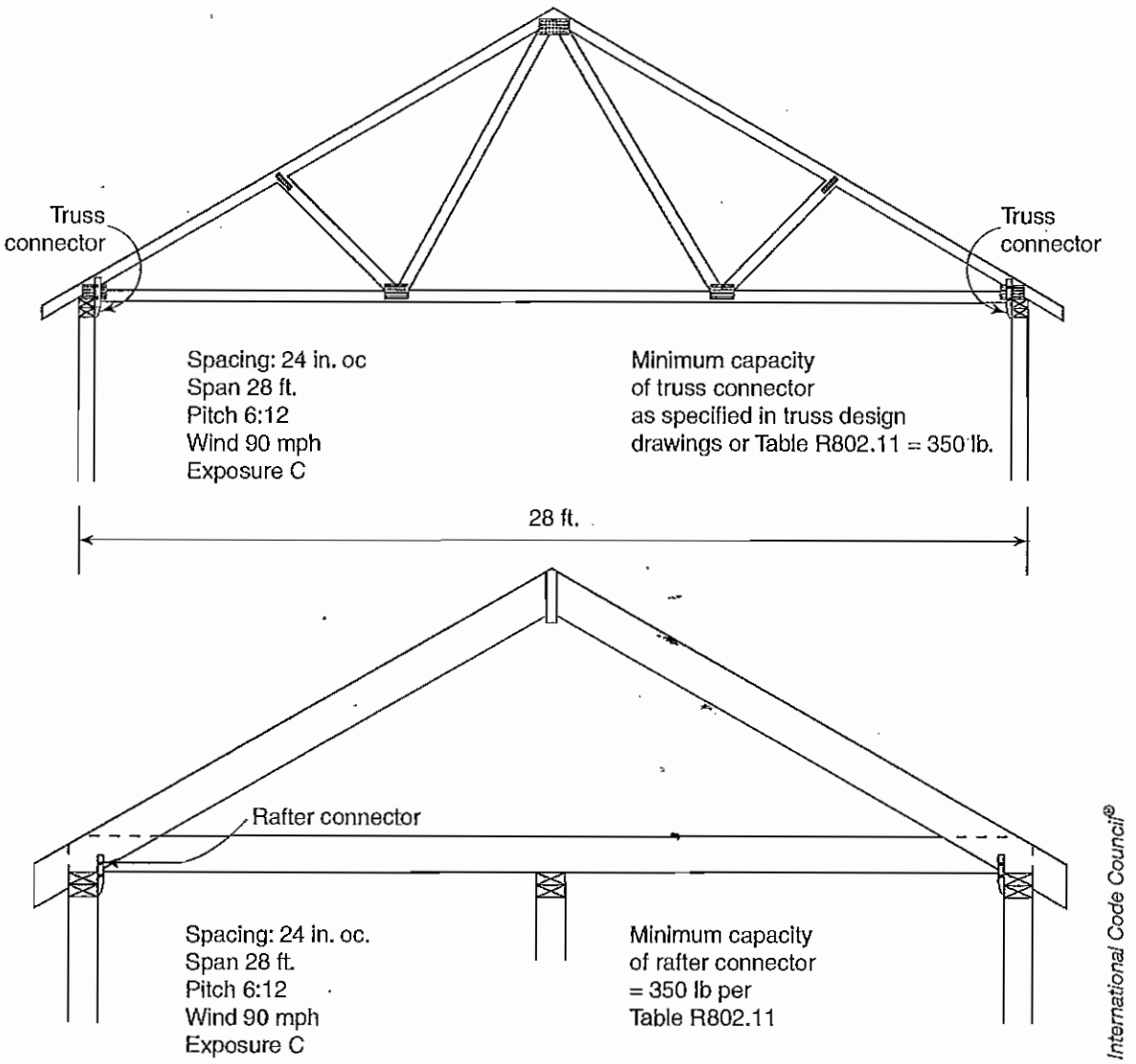
R802.11

Roof Uplift Resistance

CHANGE SUMMARY: The provisions for roof connections to resist wind uplift forces have been updated to current standards and simplified for ease of use. Table R802.11 has been replaced to provide accurate values for both low- and high-slope roofs in Wind Exposure Categories B and C.

2012 CODE: ~~**R802.10.5 Truss-to-Wall Connection.** Trusses shall be connected to wall plates by the use of *approved* connectors having a resistance to uplift of not less than 175 pounds (779 N) and shall be installed in accordance with the manufacturer's specifications. For roof assemblies subject to wind uplift pressures of 20 pounds per square foot (960 Pa) or greater, as established in Table R301.2(2), adjusted for height and exposure per Table R301.2(3), see section R802.11.~~

R802.11 continues



Rafter or truss connectors required for uplift forces greater than 200 pounds when located in Wind Exposure Category C.

R802.11 continued

R802.11 Roof Tie-down.

R802.11.1 Uplift Resistance. Roof assemblies shall have uplift resistance in accordance with Sections R802.11.1.2 and R802.11.1.3 ~~which are subject to wind uplift pressures of 20 pounds per square foot (960 Pa) or greater shall have roof rafters or trusses attached to their supporting wall assemblies by connections capable of providing the resistance required in Table R802.11. Wind uplift pressures shall be determined using an effective wind area of 100 square feet (9.3 m2) and Zone 1 in Table R301.2(2), as adjusted for height and exposure per Table R301.2(3).~~

~~A continuous load path shall be designed to transmit the uplift forces from the rafters or trusses to the foundation.~~

Where the uplift force does not exceed 200 pounds, rafters and trusses spaced not more than 24 inches (610 mm) on center shall be permitted to be attached to their supporting wall assemblies in accordance with Table R602.3(1).

Where the basic wind speed does not exceed 90 mph, the wind exposure category ~~is~~ is B, the roof pitch is 5:12 or greater, and the roof span is 32 feet (9754 mm) or less, rafters and trusses spaced not more than 24 inches (610 mm) on center shall be permitted to be attached to their supporting wall assemblies in accordance with Table R602.3(1).

R802.11.1.2 Truss Uplift Resistance. Trusses shall be attached to snpporting wall assemblies by connections capable of resisting uplift forces as specified on the truss design drawings. Uplift forces shall be permitted to be determined as specified by Table R802.11, if applicable, or as determined by accepted engineering practice.

R802.11.1.3 Rafter Uplift Resistance. Individnal rafters shall be attached to supporting wall assemblies by connections capable of resisting nplift forces as determined by Table R802.11 or as determined by accepted engineering practice. Connections for beams used in a roof system shall be designed in accordance with accepted engineering practice.

~~TABLE R802.11—Required Strength Of Truss Or Rafter Connections To Resist Wind Uplift Forces[a,b,c,e,f] (Pounds per connection)~~

~~Basic Wind Speed (mph) (3-second gust)~~	~~Roof Span (feet)~~							~~Overhangs[d] (pounds/ foot)~~
	~~12~~	~~20~~	~~24~~	~~28~~	~~32~~	~~36~~	~~40~~	
~~85~~	~~72~~	~~120~~	~~145~~	~~169~~	~~193~~	~~217~~	~~241~~	~~38.55~~
~~90~~	~~91~~	~~151~~	~~181~~	~~212~~	~~242~~	~~272~~	~~302~~	~~43.22~~
~~100~~	~~131~~	~~218~~	~~262~~	~~305~~	~~349~~	~~393~~	~~436~~	~~53.36~~
~~110~~	~~175~~	~~292~~	~~351~~	~~409~~	~~467~~	~~526~~	~~584~~	~~64.56~~

~~For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 mph = 0.447 m/s, 1 pound/foot = 14.5939 N/m, 1 pound = 0.454 kg.~~

~~a. The uplift connection requirements are based on a 30 foot mean roof height located in Exposure B. For Exposures C and D and for other mean roof heights, multiply the above loads by the Adjustment Coefficients in Table R301.2(3).~~

~~b. The uplift connection requirements are based on the framing being spaced 24 inches on center. Multiply by 0.67 for framing spaced 16 inches on center and multiply by 0.5 for framing spaced 12 inches on center.~~

continued

~~c. The uplift connection requirements include an allowance for 10 pounds of dead load.~~
~~d. The uplift connection requirements do not account for the effects of overhangs. The magnitude of the above loads shall be increased by adding the overhang loads found in the table. The overhang loads are also based on framing spaced 24 inches on center. The overhang loads given shall be multiplied by the overhang projection and added to the roof uplift value in the table.~~
~~e. The uplift connection requirements are based on wind loading on end zones as defined in Figure 6-2 of ASCE 7. Connection loads for connections located a distance of 20% of the least horizontal dimension of the building from the corner of the building are permitted to be reduced by multiplying the Table connection value by 0.7 and multiplying the overhang load by 0.8.~~
~~f. For wall-to-wall and wall-to-foundation connections, the capacity of the uplift connector is permitted to be reduced by 100 pounds for each full wall above. (For example, if a 600-pound-rated connector is used on the roof framing, a 500-pound rated connector is permitted at the next floor level down).~~

TABLE R802.11 Rafter or Truss Uplift Connection Forces from Wind (pounds per connection)

		Exposure B							
		Basic Wind Speed (MPH)							
Rafter or Truss Spacing	Roof Span (feet)	85 Roof Pitch		90 Roof Pitch		100 Roof Pitch		110 Roof Pitch	
		<5:12	≥5:12	<5:12	≥5:12	<5:12	≥5:12	<5:12	≥5:12
12" o.c.	12	47	41	62	54	93	81	127	110
	18	59	51	78	68	119	104	165	144
	24	70	61	93	81	145	126	202	176
	28	77	67	104	90	163	142	227	197
	32	85	74	115	100	180	157	252	219
	36	93	81	126	110	198	172	277	241
	42	105	91	143	124	225	196	315	274
	48	116	101	159	138	251	218	353	307
16" o.c.	12	63	55	83	72	124	108	169	147
	18	78	68	103	90	159	138	219	191
	24	93	81	124	108	193	168	269	234
	28	102	89	138	120	217	189	302	263
	32	113	98	153	133	239	208	335	291
	36	124	108	168	146	264	230	369	321
	42	139	121	190	165	299	260	420	365
	48	155	135	212	184	335	291	471	410
24" o.c.	12	94	82	124	108	186	162	254	221
	18	117	102	155	135	238	207	329	286
	24	140	122	186	162	290	252	404	351
	28	154	134	208	181	326	284	454	395
	32	170	148	230	200	360	313	504	438
	36	186	162	252	219	396	345	554	482
	42	209	182	285	248	449	391	630	548
	48	232	202	318	277	502	437	706	614

continued

R802.11 continues

R802.11 continued

		Exposure C							
		Basic Wind Speed (MPH)							
		85		90		100		110	
Rafter or Truss Spacing	Roof Span (feet)	Roof Pitch		Roof Pitch		Roof Pitch		Roof Pitch	
		<5:12	≥5:12	<5:12	≥5:12	<5:12	≥5:12	<5:12	≥5:12
12" o.c.	12	94	82	114	99	157	137	206	179
	18	120	104	146	127	204	177	268	233
	24	146	127	179	156	251	218	330	287
	28	164	143	201	175	283	246	372	324
	32	182	158	224	195	314	273	414	360
	36	200	174	246	214	346	301	456	397
	42	227	197	279	243	394	343	520	452
	48	254	221	313	272	441	384	583	507
16" o.c.	12	125	109	152	132	209	182	274	238
	18	160	139	194	169	271	236	356	310
	24	194	169	238	207	334	291	439	382
	28	218	190	267	232	376	327	495	431
	32	242	211	298	259	418	364	551	479
	36	266	231	327	284	460	400	606	527
	42	302	263	372	324	524	456	691	601
	48	338	294	416	362	587	511	775	674
24" o.c.	12	188	164	228	198	314	273	412	358
	18	240	209	292	254	408	355	536	466
	24	292	254	358	311	502	437	660	574
	28	328	285	402	350	566	492	744	647
	32	364	317	448	390	628	546	828	720
	36	400	348	492	428	692	602	912	793
	42	454	395	558	485	786	684	1040	905
	48	508	442	626	545	882	767	1166	1014

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mph = 0.447 m/s, 1 pound = 0.454 kg.

a. The uplift connection forces are based on a maximum 33 foot mean roof height and Wind Exposure Category B or C. For Exposure D, the uplift connection force shall be selected from the Exposure C portion of the Table using the next highest tabulated basic wind speed. The Adjustment Coefficients in Table R301.2(3) shall not be used to multiply the above forces for Exposures C and D or for other mean roof heights.

b. The uplift connection forces include an allowance for roof and ceiling assembly dead load of 15 psf.

c. The tabulated nplift connection forces are limited to a maximum roof overhang of 24 inches.

d. The tabulated uplift connection forces shall be permitted to be multiplied by 0.75 for connections not located within 8 feet of bnilding corners.

e. For buildings with hip roofs with 5:12 and greater pitch, the tabulated uplift connection forces shall be permitted to be mnltiplied by 0.70. This reduction shall not be combined with any other reduction in tabulated forces.

f. For wall-to-wall and wall-to-fonndation connections, the uplift connection force shall be permitted to be reduced by 60 plf for each full wall above.

g. Linear interpolation between tabulated roof spans and wind speeds shall be permitted.

h. The tabulated forces for a 12" on center spacing shall be permitted to be used to determine the uplift load in pounds per linear foot.

CHANGE SIGNIFICANCE: The IRC prescribes minimum roof-to-wall connections to resist wind uplift forces. These provisions have been the subject of much debate through several code development cycles. In particular, code users have expressed confusion in determining when a manufactured truss or rafter connector was required instead of conventional toe-nail connections in accordance with Table R602.3(1) because the code did not clearly establish a threshold or trigger point. In addition, the manufactured truss provisions required connectors to provide uplift resistance of not less than 175 pounds and in accordance with the truss design drawings, which limited flexibility in satisfying the uplift criteria and did not mesh with the roof tie-down provisions. The prescriptive connection values in Table R802.11 were based on low-slope roofs and Wind Exposure Category B only and were considered outdated and overly conservative, adding to the difficulty in accurately complying with the performance provisions for a complete load path. Section R802.11 has been completely revised to address these concerns and to provide accurate uplift loads in a tabular format.

Where rafter or truss spacing does not exceed 24 inches on center, the prescriptive connection requirements (toenailing) of Table R602.3(1) are permitted to be used under either of the following conditions:

- Where the uplift force does not exceed 200 pounds, or
- Where the roof pitch is 5:12 or greater and all of the following criteria are met:
  - 90-mph wind speed
  - Wind Exposure Category B
  - Maximum building width of 32 feet
  - Maximum roof overhang of 24 inches

In the first condition, the 200-ponnd maximum capacity for conventional rafter-to-wall or truss-to-wall connections using toe-nails is based largely on capacities calculated from AF&PA's *National Design Specification (NDS) for Wood Construction*. The applicable uplift force for a particular installation may be determined from Table R802.11.

When either of the conditions above is satisfied, an engineered connector may be used but is not required. In this case, for a conventional framing connection, Table R602.3(1) requires the rafter or truss to be toe nailed to the top plate with three 16d box nails or three 10d common nails. Two toe nails are placed on one side and one on the other side of the truss or rafter. When the uplift force exceeds 200 pounds and the building does not meet all of the criteria of the second condition above, then an engineered clip or strap connector is required. The rated capacity of the connector must meet or exceed the wind uplift value. These new provisions set an objective trigger point at which engineered metal ties or straps are required and resolve the concerns regarding the ambiguity and inconsistency of previous requirements.

The provisions for truss-to-wall connections have been removed from Section R802.10 and all connection requirements to resist wind uplift forces have been consolidated in Section R802.11. The code now provides flexibility in choosing the method for determining connection requirements for trusses and does not require use of the uplift value in

R802.11 continues

R802.11 continued the truss design drawings. While truss roof systems have an engineered design in jurisdictions that require the practice, in regions where there is no requirement for an engineered design, the uplift valne on the indivdnal truss design drawings may not necessarily reflect an accurate evaluation of all site, wind, and bnilding conditions. Therefore, the option of using Table R802.11 has been retained for trusses.

The three options provided for selecting a connection to resist uplift for manufactured trusses are:

- Truss design drawings
- Table R802.11
- An engineered approach

Table R802.11 in the previous edition of the IRC had not been npdated for some time and was considered to be overly conservative for many typical houses. The uplift loads were based on low-slope (4:12 pitch or less) roofs and did not account for the reduction in uplift loads that occur on higher-slope (5:12 pitch or greater) roofs or on hip roofs in accordance with ASCE 7. Table R802.11 has been replaced with a new Table based on Table 2.2A of the *Wood Frame Construction Manual* (WFCM), which is based on the ASCE 7-05 wind load provisions. In addition to providing values for both Wind Exposure Categories B and C, the new table expands upon both the existing IRC table and the WFCM table by incorporating values for high-slope roofs. These factors were derived using the ASCE 7 wind provisions and the calculation method nsed to develop Table 2.2A of the WFCM. When the roof slope is 5:12 or greater, footnote e provides a further reduction for hip roofs becanse hips roofs have demonstrated improved performance in high-wind events.

In addition to improving the understanding and accuracy of the provisions, the changes intend to encourage designers and builders to nse hip roofs and high-slope roofs. Because these types of roofs perform better than low-slope roofs in high-wind events, uplift loads are appropriately reduced and may avoid triggering manufactured uplift connector requirements.

R806
Roof Ventilation

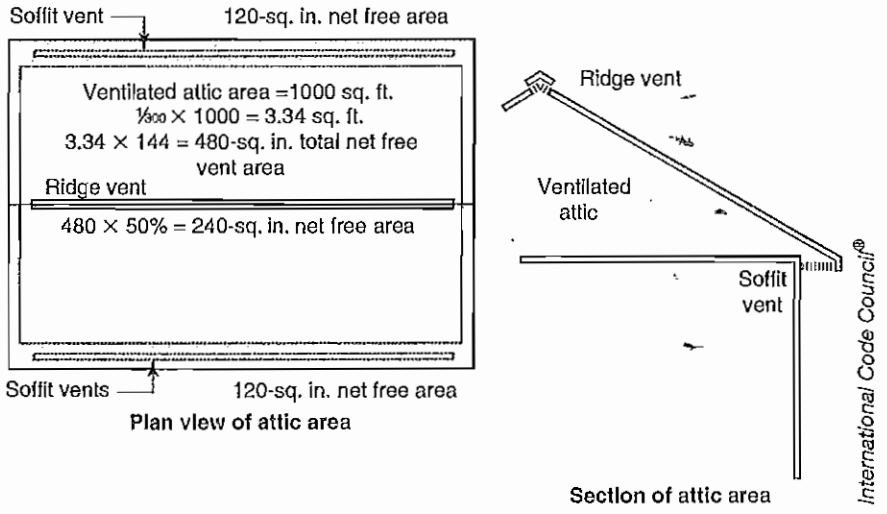
CHANGE TYPE: Modification

CHANGE SUMMARY: The code now provides an option to omit attic ventilation where climate and experience demonstrate it is not necessary. The provisions for minimum vent area have been revised by placing two exceptions after the general rule to clarify the meaning. The exception for reducing the ventilation area when a vapor retarder is installed on the ceiling now only applies to cold-weather climates. The reduction in vent area based on cross ventilation now requires no less than 40% and no more than 50% (previously 50% and 80%) of the required ventilating area to be placed in the upper portion of the roof and no more than 3 feet below the ridge. The requirement for the upper vents to be at least 3 feet above the eave vents has been removed.

2012 CODE: R806.1 Ventilation Required. Enclosed attics and enclosed rafter spaces formed where ceilings are applied directly to the underside of roof rafters shall have cross ventilation for each separate space by ventilating openings protected against the entrance of rain or snow. Ventilation openings shall have a least dimension of 1/16-inch (1.6 mm) minimum and 1/4-inch (6.4 mm) maximum. Ventilation openings having a least dimension larger than 1/4 inch (6.4 mm) shall be provided with corrosion-resistant wire cloth screening, hardware cloth, or similar material with openings having a least dimension of 1/16-inch (1.6 mm) minimum and 1/4-inch (6.4 mm) maximum. Openings in roof framing members shall conform to the requirements of Section R802.7. Required ventilation openings shall open directly to the outside air.

Exception: Attic ventilation shall not be required when determined not necessary by the code official due to atmospheric or climatic conditions.

R806 continues



Roof ventilation

R806 continued

R806.2 Minimum Vent Area. The ~~total~~ minimum net free ventilating area shall ~~not~~ be ~~less than~~ 1/150 of the area of the vented space ~~ventilated except that reduction of the total area to 1/300 is permitted provided that at least 50 percent and not more than 80 percent of the required ventilating area is provided by ventilators located in the upper portion of the space to be ventilated at least 3 feet (914 mm) above the eave or cornice vents with the balance of the required ventilation provided by eave or cornice vents. As an alternative, the net free cross-ventilation area may be reduced to 1/300 when a Class I or II vapor barrier is installed on the warm-in-winter side of the ceiling~~.

Exceptions: The minimum net free ventilation area shall be 1/300 of the vented space provided one or more of the following conditions are met:

1. In climate zones 6, 7, and 8 a Class I or Class II vapor retarder is installed on the warm-in-winter side of the ceiling.
2. At least 40 percent and not more than 50 percent of the required ventilating area is provided by ventilators located in the upper portion of the attic or rafter space. Upper ventilators shall be located no more than 3 feet (914 mm) below the ridge or highest point of the space, measured vertically, with the balance of the required ventilation provided by eave or cornice vents. Where the location of wall or roof framing members conflicts with the installation of upper ventilators, installation more than 3 feet (914 mm) below the ridge or highest point of the space shall be permitted.

R806.3 Vent and Insulation Clearance. Where eave or cornice vents are installed, insulation shall not block the free flow of air. A minimum of a 1-inch (25 mm) space shall be provided between the insulation and the roof sheathing and at the location of the vent.

R806.4 Installation and Weather Protection. Ventilators shall be installed in accordance with manufacturer's installation instructions. Installation of ventilators in roof systems shall be in accordance with the requirements of Section R903. Installation of ventilators in wall systems shall be in accordance with the requirements of Section R703.1.

CHANGE SIGNIFICANCE: Attic ventilation serves to prevent moisture build-up and condensation within attic spaces. In certain warm, dry climates, experience has shown that attics without ventilation do not experience the detrimental effects of moisture. The IRC now specifically allows the building official to determine if attic ventilation is required based on the local climate. Although the building official has authority under Section R104.10 to grant modifications to the code and authority under Section R104.11 to approve alternative methods and materials that satisfy the intent and purpose of the code, this new exception is specific to attic ventilation requirements.

In Section R806.2, the long paragraph describing the options for determining the amount of ventilation required was deemed awkward and difficult to understand. This section has been revised to place the general rule

in one clear sentence followed by the exceptions permitting a reduction in the net ventilating area. The minimum ventilating amounts remain the same—a net free vent area of 1/150 of the vented space with a reduction to 1/300 of the vented space when complying with one of two criteria. There are changes to the exceptions, though. Previously, the ventilating area could be cut in half if a Class I or Class II vapor retarder was installed on the ceiling of the conditioned space. The change recognizes that application of a vapor retarder in warm climates creates moisture problems and should not be allowed. For reducing the net vent area, the new language in the first exception limits the use of the vapor retarder to cold climates: Climate Zones 6, 7, and 8. The revised text also changes the term "vapor barrier" to the correct, defined term "vapor retarder."

The second exception changes the ratio requirements for dividing the ventilation between roof vents and soffit or eave vents. The code has always recognized the improved effectiveness of cross ventilation in moving air through an attic space to reduce moisture content and prevent condensation within the space. Previously, the code prescribed the roof vents to supply a minimum of 50% and not more than 80% of the total required vent area, with the balance supplied by soffit vents. Cross ventilation is most effective when the required amount of venting is split approximately equal for upper and lower vent locations. The revised language requires no less than 40% and no more than 50% of the total required vent area to be supplied by the upper vents. The upper vents are no longer required to be at least 3 feet above the eave vents. Because this measurement is taken vertically, the 3-foot separation may be difficult to achieve with low-slope roofs. The code now requires that the upper vents be located no more than 3 feet below the ridge unless obstructions make this location infeasible.

The last part of the revisions to attic ventilation clarifies that vents must be installed in accordance with the manufacturer's installation instructions and must provide weather protection as prescribed in Chapters 7 and 9. Use of the term "ventilators" is not meant to imply that mechanical or wind-driven ventilators are required. In this context, "ventilators" refers to any type of approved vent, such as conventional ridge, roof, and soffit vents.

R907.3

Recovering versus Replacement of Roofing

International Code Council®

Reroofing

CHANGE TYPE: Modification

CHANGE SUMMARY: The hail exposure map, related definitions, and the limitations on reroofing in hail zones have been deleted from the code. A new exception clarifies that the reroofing provisions do not require the removal of self-adhered ice barrier underlayment.

2012 CODE: R907.3 Recovering Versus Replacement. New roof coverings shall not be installed without first removing all existing layers of roof coverings where any of the following conditions exist:

1. Where the existing roof or roof covering is water-soaked or has deteriorated to the point that the existing roof or roof covering is not adequate as a base for additional roofing.
2. Where the existing roof covering is wood shake, slate, clay, cement or asbestos-cement tile.
3. Where the existing roof has two or more applications of any type of roof covering.
4. ~~For asphalt shingles, when the building is located in an area subject to moderate or severe hail exposure according to Figure R903.5.~~

Exceptions:

1. Complete and separate roofing systems, such as standing-seam metal roof systems, that are designed to transmit the roof loads directly to the building's structural system and that do not rely on existing roofs and roof coverings for support, shall not require the removal of existing roof coverings.
2. Installation of metal panel, metal shingle, and concrete and clay tile roof coverings over existing wood shake roofs shall be permitted when the application is in accordance with Section R907.4.
3. The application of new protective coating over existing spray polyurethane foam roofing systems shall be permitted without tear-off of existing roof coverings.
4. Where the existing roof assembly includes an ice barrier membrane that is adhered to the roof deck, the existing ice barrier membrane shall be permitted to remain in place and covered with an additional layer of ice barrier membrane in accordance with Section R905.

~~**R903.5 Hail Exposure.** Hail exposure, as specified in Sections R903.5.1 and R903.5.2, shall be determined using Figure R903.5.~~
~~Hail Exposure Map~~

~~**R903.5.1 Moderate Hail Exposure.** One or more hail days with hail diameters larger than 1.5 inches (38 mm) in a 20-year period.~~

~~**R903.5.2 Severe Hail Exposure.** One or more hail days with hail diameters larger than or equal to 2.0 inches (51 mm) in a 20-year period.~~

CHANGE SIGNIFICANCE: The provisions prohibiting a second layer of asphalt shingles in designated areas of moderate or severe hail exposure first appeared in the 2006 IRC. The hail exposure map and definitions for severe and moderate hail exposure accompanied this change and applied only to asphalt shingles in Item 4 of Section R907.3. The intent was to reduce damage and insurance losses by limiting the overall thickness of multiple layers of asphalt shingles. Additional layers create a softer substrate for the weather layer and increase the severity of damage in a hail storm. All of these provisions related to hail have been removed from the 2012 IRC. The requirements were thought to be overly conservative because they were based on a 20-year occurrence and did not provide any significant benefit to the homeowner. Proponents of the change also stated that there was no substantiating data to justify inclusion of the requirements related to hail exposure. The performance requirement for providing a base that is not deteriorated and provides satisfactory support for additional roofing material was deemed adequate and preferable to hail exposure requirements for asphalt shingles.

When the code requires tear-off of the old roofing material before installing the new roof, the addition of Exception 4 clarifies that an adhered ice barrier does not need to be removed. Removal of a self-adhered ice barrier membrane results in damage to the roof sheathing. In this application, the code allows for an additional layer of self-adhered nnderlayment to be applied over the existing membrane before applying the new roofing material.

703.7

Identification of Fire and Smoke Separation Walls

CHANGE TYPE: Modification

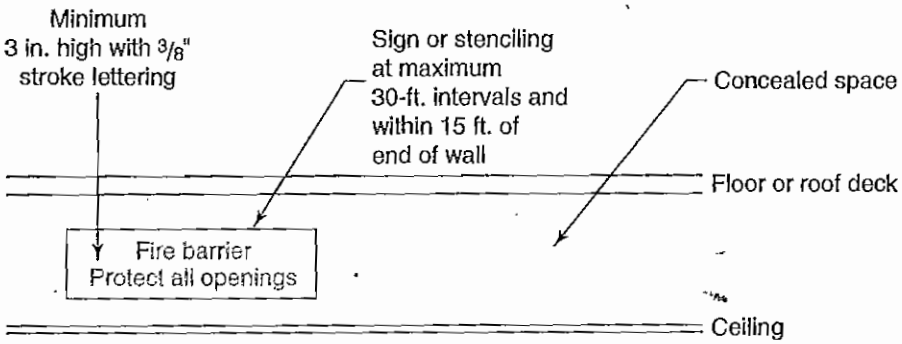
CHANGE SUMMARY: The size and location of identifying markings required on vertical fire assemblies in accessible above-ceiling spaces have been modified to increase the potential for such markings to be seen.

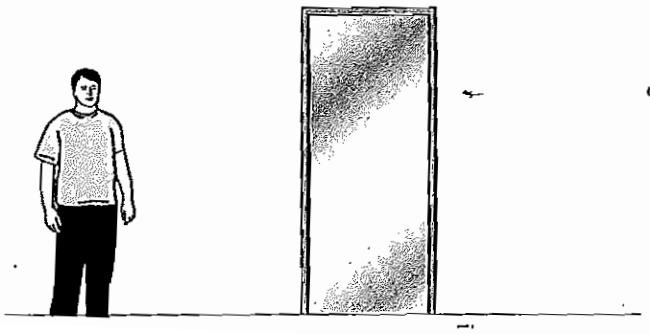
2012 CODE: 703.7 Marking and Identification. Fire walls, fire barriers, fire partitions, smoke barriers, and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:

1. Be located in accessible concealed floor, floor/ceiling, or attic spaces
2. Be located within 15 feet (4572 mm) of the end of each wall and ~~repeated~~ at intervals not exceeding 30 feet (9144 mm) measured horizontally along the wall or partition
3. Include lettering not less than ~~0.5 inch (12.7 mm)~~ 3 inches (76 mm) in height with a minimum ⅜-inch (9.5-mm) stroke in a contrasting color incorporating the suggested wording: "FIRE AND/OR SMOKE BARRIER—PROTECT ALL OPENINGS" or other wording.

Exception: Walls in Group R-2 occupancies that do not have a removable decorative ceiling allowing access to the concealed space.

703.7 continues





703.7 continued

CHANGE SIGNIFICANCE: The integrity of fire and/or smoke separation walls is subject to compromise during the life of a building. During maintenance and remodel activities, it is not uncommon for new openings and penetrations to be installed in a fire separation wall without the recognition that the integrity of the construction must be maintained or that some type of fire or smoke protective is required. Provisions mandating the appropriate identification of such walls under certain conditions have been modified to better ensure that tradespeople, maintenance workers, and inspectors will recognize the required level of protection that must be maintained.

It is intended that the identification marks be located in areas not visible to the general public. Specific locations set forth in the provisions indicate that the identification is to be provided above any lay-in panel ceiling or similar concealed space that is deemed to be accessible. In addition to previous requirements for locating the identifying markings at maximum 30-foot intervals, it is now also necessary that such markings be provided no more than 15 feet from the end of each wall requiring such identification. This additional requirement increases the possibility that the identifying markings will be visible during any work on the wall assemblies. The minimum required letter height has also been increased from ½ inch to 3 inches to make the markings much more visible. In addition, a minimum stroke width has been established at ⅜ inch and the lettering must be of a color that contrasts with its background. All of the code modifications are intended to increase the possibility that the identification of the information will be achieved.

The requirements apply to all wall assemblies where openings or penetrations are required to be protected. This would include exterior fire-resistance-rated walls as well as fire walls, fire barriers, fire partitions, smoke barriers, and smoke partitions.

706.2

Double Fire Walls

CHANGE TYPE: Addition

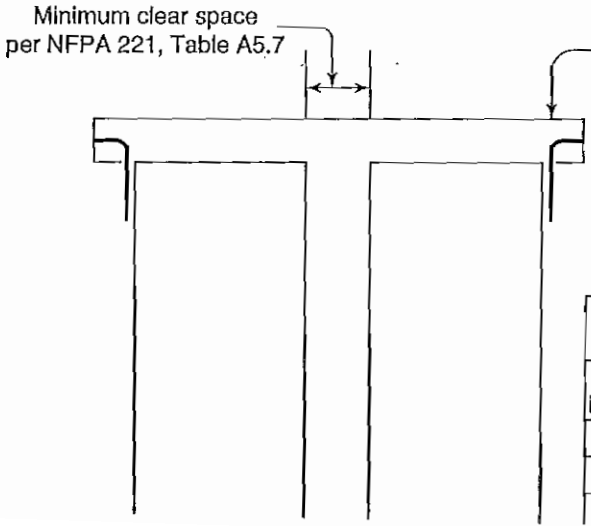
CHANGE SUMMARY: In order to satisfy the intended objective of structural stability, the use of a double fire wall complying with NFPA 221 is now permitted as an alternative to a single fire wall.

2012 CODE: 706.2 Structural Stability. Fire walls shall have sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall for the duration of time indicated by the required fire-resistance rating or shall be constructed as double fire walls in accordance with NFPA 221.

CHANGE SIGNIFICANCE: Fire walls are fire-resistance-rated building elements constructed within a structure that are utilized to create two or more smaller-area buildings. Each portion of the structure so separated may be considered a separate and unique building for all purposes of the code. One of the key criteria to the design and construction of a fire wall is that it performs structurally under fire conditions in a manner that will maintain the integrity of the fire separation. A new allowance permits the use of a double fire wall in lieu of a single fire wall that satisfies the intended objective of structural stability.

Double fire walls are simply two back-to-back walls, each having an established fire-resistive rating. While acceptable for use in a new structure, double fire walls are most advantageous where an addition is being constructed adjacent to an existing buildiug and the intent is to regulate the addition as a separate building under the fire wall provisions. The exterior wall of the existing building, if compliant, can be utilized as one wall of the double wall system, with the new wall of the addition providing the second wall.

Double fire wall assemblies are to comply with the applicable provisions of NFPA 221, *Standard for High Challenge Fire Walls, Fire Walls,*



Minimum fire wall rating (in hours)	
Rating of individual walls	Total double wall rating
3	4
2	3
1	2

and Fire Barrier Walls. This standard addresses a number of criteria for double fire walls, including fire-resistance rating, connections, and structural support. In order to meet the minimum fire-resistance rating for a fire wall as set forth in IBC Table 706.4, each individual wall of a double fire wall assembly is permitted to be reduced to 1 hour less than the minimum required rating for a single fire wall. For example, where IBC Table 706.4 requires the use of a minimum 3-hour fire wall, two 2-hour fire-resistance-rated (double) fire walls can be utilized. Similarly, two 3-hour fire walls in a double wall system can be considered as a single 4-hour fire wall, and two 1-hour fire walls used as a double wall qualify as a single 2-hour fire wall.

Because the intended goal of fire wall construction is to allow collapse of a building on either side of the fire wall while maintaining an acceptable level of fire separation, the only connection permitted by NFPA 221 between the two walls that make up the double fire wall is the flashing, if provided. Illustrated in the explanatory material to the standard, the choice of flashing methods must provide for separate flashing sections in order to maintain a complete physical separation between the walls. Each individual wall of the double wall assembly must be supported laterally without any assistance from the adjoining building. In addition, a minimum clear space between the two walls is recommended by NFPA 221 in order to allow for thermal expansion between unprotected structural framework, where applicable, and the wall assemblies that make up the double fire wall.

707.8, 707.9

Intersections of Fire Barriers at Roof Assemblies

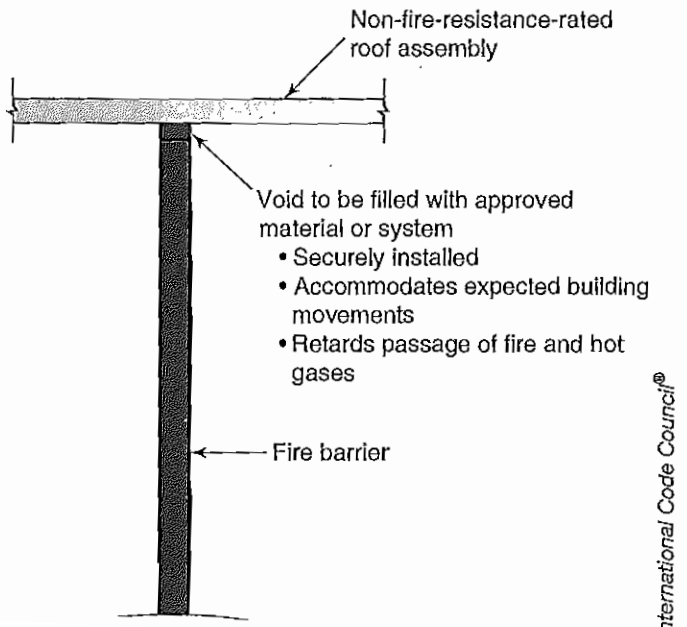
CHANGE TYPE: Modification

CHANGE SUMMARY: The void at the intersection between a fire barrier and a nonfire-resistance rated roof assembly now need only be protected with an approved material rather than a fire-resistant joint system.

2012 CODE: 707.8 Joints. Joints made in or between fire barriers and joints made at the intersection of fire barriers with the underside of ~~the~~ a fire-resistance rated floor or roof sheathing, slab, or deck above, and the exterior vertical wall intersection shall comply with Section 715.

707.9 Voids at Intersections. The voids created at the intersection of a fire barrier and a non-fire-resistance-rated roof assembly shall be filled. An approved material or system shall be used to fill the void, shall be securely installed in or on the intersection for its entire length so as not to dislodge, loosen, or otherwise impair its ability to accommodate expected building movements and to retard the passage of fire and hot gases.

CHANGE SIGNIFICANCE: A fire barrier is one of several specific elements established in the IBC to provide a fire-resistance-rated separation of adjacent spaces to safeguard against the spread of fire aud smoke. Limited to fire-resistauce-rated wall assemblies, fire barriers must extend from the floor to the bottom of the floor or roof sheathing, deck, or slab directly above. This high degree of required continuity minimizes the potential for fire spread from one area to another over the top of the wall. Historically, where a head-of-wall or similar joint was created at the intersection of the fire barrier and the floor or roof sheathing, deck, or slab above, a fire-resistant joint system complying with ASTM E 1966 or UL 2079 has been required. New language addressing the void at the intersection between a



fire barrier and a non-fire-resistance-rated roof assembly now allows for a reduced degree of protection.

The two conditions of top-of-wall joints at fire barriers are now addressed differently based upon the type of floor or roof construction involved. Where a fire barrier intersects with a floor or a fire-resistance-rated roof assembly above, the joint must continue to comply with the provisions of Section 715 addressing fire-resistant joint systems. However, a reduced degree of joint protection is now afforded where a fire barrier intersects with a non-fire-resistance-rated roof assembly. The void at the joint need only be an approved material that is securely installed and capable of retarding the passage of fire and hot gases. It is important to note that the allowance for use of an approved material rather that a complying fire-resistant joint system is not applicable where the joint occurs at a non-fire-resistance-rated floor assembly.

712
Vertical Openings

CHANGE TYPE: Clarification

CHANGE SUMMARY: A significant reformatting in Chapter 7 now places the emphasis on the presence of vertical openings rather than on shaft enclosures, recognizing that the use of shaft enclosures is just one of many acceptable protective measures that can be utilized to address the hazards related to vertical openings.

2012 CODE:

SECTION ~~708~~ 712
~~SHAFT ENCLOSURES~~ VERTICAL OPENINGS

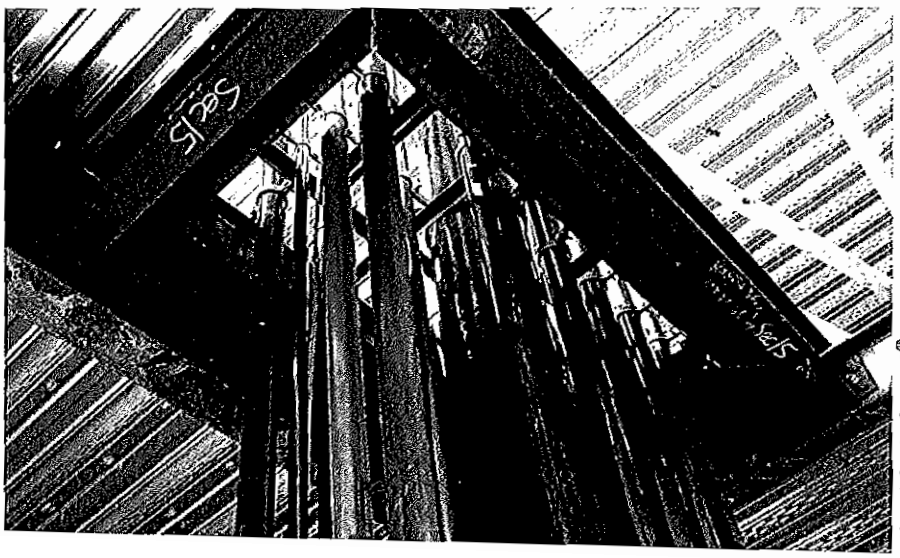
~~708.1~~ 712.1 General. The provisions of this section shall apply to the vertical opening applications listed in Sections 712.1.1 through 712.1.18. ~~shafts required to protect openings and penetrations through floor/ceiling and roof/ceiling assemblies. Shaft enclosures shall be constructed as fire barriers in accordance with Section 707 or horizontal assemblies in accordance with Section 712, or both.~~

~~708.2 Shaft Enclosure Required.~~ ~~Openings through a floor ceiling assembly shall be protected by a shaft enclosure complying with this section.~~

Exceptions: (Exceptions 1 through 16 have been reformatted as Sections 712.1.2 through 712.1.18 with limited editorial changes.)

712.1.1 Shaft Enclosures. Vertical openings contained entirely within a shaft enclosure complying with Section 713 shall be permitted.

712 continues



712 continued

SECTION 713
SHAFT ENCLOSURES

713.1 General. The provisions of this section shall apply to shafts required to protect openings and penetrations through floor/ceiling and roof/ceiling assemblies. Exit access stairways and exit access ramps shall be protected in accordance with the applicable provisions of Section 1009. Interior exit stairways and interior exit ramps shall be protected in accordance with the requirements of Section 1022.

713.2 Construction. Shaft enclosures shall be constructed as fire barriers in accordance with Section 707 or horizontal assemblies in accordance with Section 711, or both.

(remainder of section remains relatively unchanged from 2009 IBC Section 708)

CHANGE SIGNIFICANCE: In multi-story buildings, the upward transmission of fire, smoke, and toxic gases through openings in the floor/ceiling assemblies continues to be a hazard of the highest degree. Historically, the provisions of the code intended to address such concerns have primarily been located under the requirements for shaft enclosures. The fundamental premise has been that a shaft enclosure is mandated to protect openings within a floor/ceiling assembly. Other methods of protection were simply identified as exceptions to the shaft enclosure approach. The code has been reformatted in a manner that now places the emphasis on the presence of vertical openings, while identifying the use of shaft enclosures as one of many protective measures that can be utilized to address the concern.

The criteria for shaft enclosures have been maintained as Section 713 for those situations where a shaft enclosure is used as the desired method of opening protection. Limited technical changes were made to the shaft enclosure provisions.

716.3, 202

Marking of Fire-Rated Glazing Assemblies

CHANGE TYPE: Clarification

CHANGE SUMMARY: Table 716.3 has been added to define and relate the various test standards for fire-rated glazing, now defined in Chapter 2, to the designations used to mark such glazing.

2012 CODE:

202 Definitions.

Fire-Rated Glazing. Glazing with either a fire protection rating or a fire resistance rating.

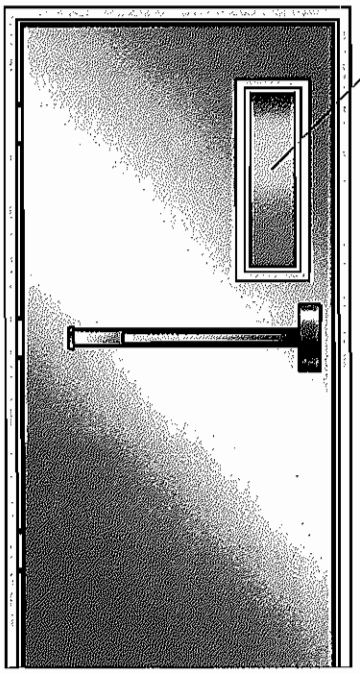
716.3 Marking Fire-Rated Glazing Assemblies. Fire-rated glazing assemblies shall be marked in accordance with Tables 716.3, 716.5, and 716.6.

716.3.1 Fire-Rated Glazing That Exceeds the Code Requirements. Fire-rated glazing assemblies marked as complying with hose stream requirements (H) shall be permitted in applications that do not require compliance with hose stream requirements. Fire-rated glazing assemblies marked as complying with temperature rise requirements (T) shall be permitted in applications that do not require compliance with temperature rise requirements. Fire-rated glazing assemblies marked with ratings (XXX) that exceed the ratings required by this code shall be permitted.

TABLE 716.3 Marking Fire-Rated Glazing Assemblies

Fire Test Standard	Marking	Definition Of Marking
ASTM E 119 or UL 263	W	Meets wall assembly criteria.
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

CHANGE SIGNIFICANCE: Fire separation elements such as fire barriers and fire walls will often include glazing in some form, such as glazed wall assemblies, fire windows, and/or glazed fire doors. A definition of "fire-rated glazing" has been added to Chapter 2 that encompasses both types of such glazing addressed by the code: fire-resistance-rated glazing and fire-protection-rated glazing. Fire-resistance-rated glazing, introduced in Section 703.6, must be tested in accordance with ASTM E 119 or UL 263 as a wall assembly. Fire-protection-rated glazing, established for use by Section 715.6, is to be tested in accordance with NFPA 257 or UL 9 as an



Marking of fire-rated glazing in fire door

Both fire-resistance-rated glazing and fire-protection-rated glazing must be appropriately identified for verification of its appropriate application. These markings will establish compliance with hose-stream and temperature rise requirements, while also identifying the minimum assembly rating in minutes. It is not unusual for such glazing to be marked to indicate a higher degree of protection than mandated by the code. A new provision clarifies that the use of glazing marked to indicate a higher level of compliance is permitted for use where such compliance is not required.

Table 716.3 has been added to define and relate the various test standards for fire-rated glazing to the designations used to mark such glazing. The marking of fire-rated glazing has been simplified by deleting the "NH" (not hose stream tested) and NT (not temperature rise tested) designations, because these designations correspond with test standards, not end uses. The table reflects the continued use of the designations "W," "OH," "D," "DT," "DH," and "XXX" as markings for fire-rated glazing. Tables 716.5 and 716.6 set forth the markings required for acceptance in specified applications.

Table 716.6

Fire-Protection-Rated Glazing

CHANGE TYPE: Clarification

CHANGE SUMMARY: In addition to fire window assembly fire-protection ratings, Table 716.6 now identifies the markings required on the fire-rated glazing for acceptance in specified applications.

2012 CODE: ~~715.5~~ 716.6 Fire-Protection-Rated Glazing. Glazing in fire window assemblies shall be fire-protection rated in accordance with this section and Table 716.6. Glazing in fire door assemblies shall comply with Section 716.5.8. Fire-protection-rated glazing in fire window assemblies shall be tested in accordance with and shall meet the acceptance criteria of NFPA 257 or UL 9. Fire-protection-rated glazing shall also comply with NFPA 80. Openings in nonfire-resistance-rated exterior wall assemblies that require protection in accordance with Section 705.3, 705.8, 705.8.5, or 705.8.6 shall have a fire-protection rating of not less than ¾ hour. Fire protection-rated glazing in 0.5-hour fire-resistance-rated partitions is permitted to have a 0.33-hour fire-protection rating.

Exceptions:

~~2. Fire protection-rated glazing in 0.5-hour fire-resistance-rated partitions is permitted to have an 0.33-hour fire-protection rating.~~

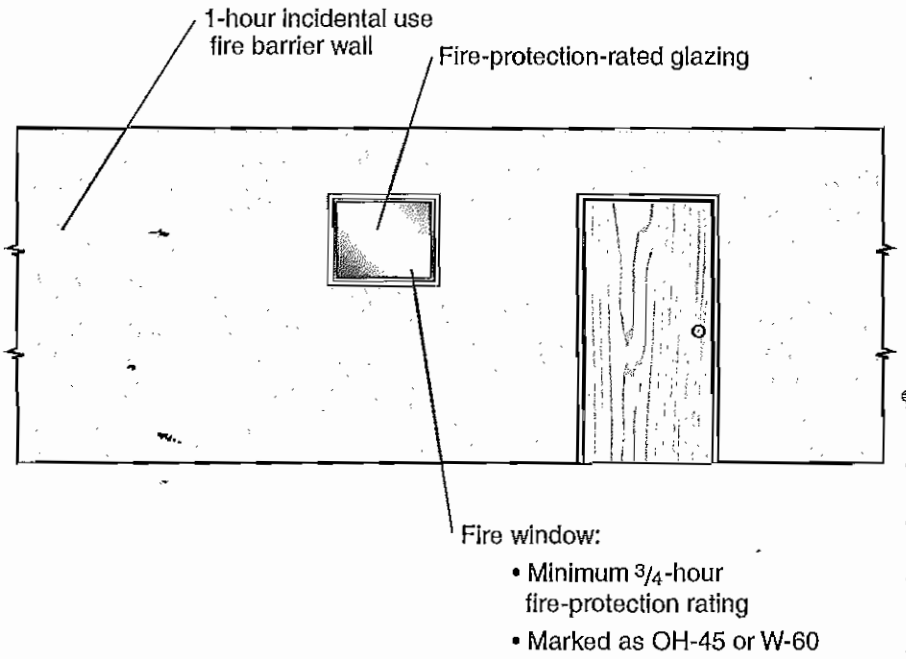
716.6 continues

TABLE ~~715.5~~ 716.6 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	NP[a]	W-xxx[b]
	1	NP[a]	W-xxx[b]
Incidental-use areas (707.3.6)	1	¾	OH-45 or W-60
Mixed-occupancy separations (707.3.8)			
Fire partitions	1	¾	OH-45 or W-60
	0.5	⅓	OH-20 or W-30
Smoke barriers	1	¾	OH-45 or W-60
Exterior walls	>1	1½	OH-90 or W-XXX[b]
	1	¾	OH-45 or W-60
	0.5	½	OH-20 or W-30
Party wall	All	NP	Not applicable

NP = Not Permitted

716.6 continued



Fire window in incidental-use fire barrier wall

CHANGE SIGNIFICANCE: In many situations, it is necessary to provide glazed openings in fire-resistance-rated walls. Fire window assemblies satisfy this need as opening protectives in fire partitions, smoke barriers, exterior walls, and specified fire barriers. Table 716.6 has historically identified the minimum fire-protection rating required for fire windows based upon the type of wall assembly and the required wall assembly rating. The table now also identifies the marking required on the fire-rated glazing for acceptance in specified applications. By inserting the marking information into Table 716.6, it is intended to provide building and fire code officials with easy access to all of the information needed when inspecting fire window installations, including required marking designations.

As part of the table's expansion, the allowance for 3/4-hour fire windows in fire barriers utilized as incidental use separations and occupancy separations has been relocated from the text of the IBC. In addition, fire window requirements for ½-hour fire-resistance-rated exterior walls have been included, however the IBC cnrrently has no requirement for the use of such walls.

716.6.4

Wired Glass in Fire Window Assemblies

CHANGE TYPE: Deletion

CHANGE SUMMARY: The allowance for the use of wired glass without compliance with the appropriate test standards has been deleted.

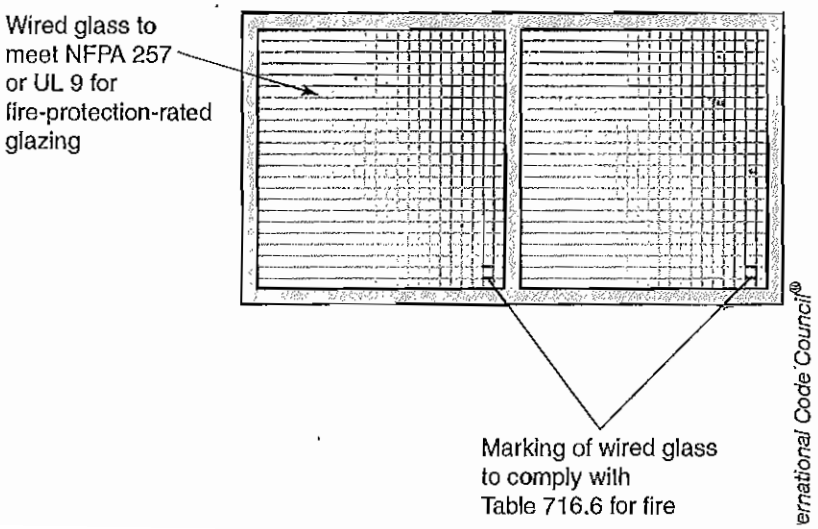
2012 CODE: ~~715.5~~ 716.6 Fire-Protection-Rated Glazing. Glazing in fire window assemblies shall be fire-protection rated in accordance with this section and Table 716.6. Glazing in fire door assemblies shall comply with Section 716.5.8. Fire-protection-rated glazing in fire window assemblies shall be tested in accordance with and shall meet the acceptance criteria of NFPA 257 or UL 9. Fire-protection-rated glazing shall also comply with NFPA 80. Openings in non-fire-resistance-rated exterior wall assemblies that require protection in accordance with Section 705.3, 705.8, 705.8.5, or 705.8.6 shall have a fire-protection rating of not less than ¾ hour. Fire protection-rated glazing in 0.5-hour fire-resistance-rated partitions is permitted to have a 0.33-hour fire-protection rating.

Exceptions:

~~1. Wired glass in accordance with Section 715.5.4.~~

~~**715.5.4 Wired glass.** Steel window frame assemblies of 0.125-inch (3.2 mm) minimum solid section or of not less than nominal 0.048-inch-thick (1.2 mm) formed sheet steel members fabricated by pressing, mitering, riveting, interlocking or welding and having provision for glazing with ¼-inch (6.4 mm) wired glass where securely installed in the building construction and glazed with ¼-inch (6.4 mm) labeled wired glass shall be deemed to meet the requirements for a ¾-hour fire window assembly. Wired glass panels shall conform to the size limitations set forth in Table 715.5.4.~~

716.6.4 continues



716.6.4 continued

~~TABLE 715.5.4 Limiting Sizes Of Wired Glass Panels~~

~~Opening Fire Protection Rating~~	~~Maximum Area (Square Inches)~~	~~Maximum Height(Inches)~~	~~Maximum Width (Inches)~~
~~3 hours~~	~~0~~	~~0~~	~~0~~
~~1½ hour doors in exterior walls~~	~~0~~	~~0~~	~~0~~
~~1 and 1½ hours~~	~~100~~	~~33~~	~~10~~
~~¾ hours~~	~~1,296~~	~~54~~	~~54~~
~~20 minutes~~	~~Not Limited~~	~~Not Limited~~	~~Not Limited~~
~~Fire window assemblies~~	~~1,296~~	~~54~~	~~54~~

~~**715.5.5 Nonwired glass.**~~ **716.6.4 Glass and Glazing.** Glazing ~~other than wired glass~~ in fire window assemblies shall be fire-protection-rated glazing installed in accordance with and complying with the size limitations set forth in NFPA 80.

CHANGE SIGNIFICANCE: Where glazing occurs in walls that require openings to have a fire-protection rating, such glazing (fire windows) must be tested in accordance with either NFPA 257, *Standard for Fire Test for Window and Glass Block Assemblies*, or UL 9, *Fire Tests of Window Assemblies*. Other than fire-resistance-rated glazing, the only glazing permitted without such a fire-protection rating has historically been wired glass installed within a steel frame in accordance with specific prescriptive provisions established by the code. The allowance for the use of wired glass without compliance with the appropriate test standards has been removed, along with the companion Table 715.5.4, which addressed the maximum size of wired glass panels. Specific reference to the use of wired glass in fire window assemblies has also been deleted from NFPA 80, *Fire Doors and Other Opening Protectives*, which regulates the installation and size limitations of such assemblies. With the removal of Exception 1 to Section 715.5, all glazing in fire-window assemblies must now be fire protection rated, including wired glass.

The use of traditional wired glass has been prohibited for some time in fire doors because it does not meet the CPSC safety glazing requirements of IBC Section 2406.1. Table 715.5.4 has been confusing to many code users because it appears to prescribe permitted size limits for wired glass in doors which are no longer allowed of any significant size. The only accepted application for wired glass is in fire assemblies in nonhazardous locations, and it was determined that a table was not needed to prescribe those size limitations.

804.4

Interior Floor Finish Requirements

CHANGE TYPE: Clarification

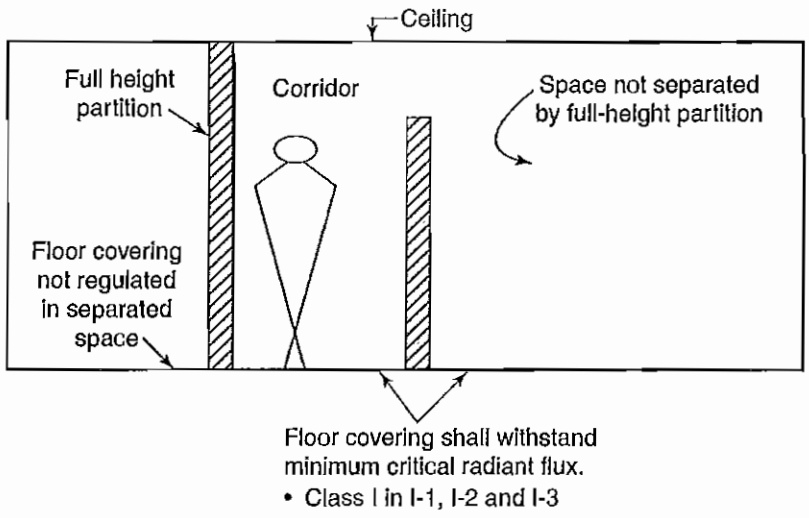
CHANGE SUMMARY: Where fibrous floor finishes are used, it has been clarified that rooms or spaces that are not separated from the corridor by full-height walls must meet the same requirements as the corridor regarding floor finish material.

2012 CODE: **804.4 Interior Floor Finish Requirements.** Interior floor covering materials shall comply with Sections 804.4.1 and 804.4.2, and interior floor finish materials shall comply with Section 804.4.2. ~~In all occupancies, interior floor finish and floor covering materials in exit enclosures, exit passageways, corridors and rooms or spaces not separated from corridors by full-height partitions extending from the floor to the underside of the ceiling shall withstand a minimum critical radiant flux as specified in Section 804.4.1.~~

~~**804.4.1 Minimum Critical Radiant Flux.** Interior floor finish and floor covering materials in exit enclosures, exit passageways and corridors shall not be less than Class I in Groups I-1, I-2 and I-3 and not less than Class II in Groups A, B, E, H, I- 4, M, R-1, R-2 and S. In all areas, floor covering materials shall comply with the DOC FF-1 "pill test" (CPSC 16 CFR, Part 1630).~~

804.4.1 Test Requirement. In all occupancies, interior floor covering materials shall comply with the requirements of the DOC FF-1 "pill test" (CPSC 16 CFR, Part 1630) or with ASTM D 2859.

804.4.2 Minimum Critical Radiant Flux. In all occupancies, interior floor finish and floor covering materials in enclosures for stairways and ramps, exit passageways, corridors, and rooms or spaces not separated from corridors by partitions extending from the floor to the underside of the ceiling shall withstand a minimum critical radiant flux. The minimum critical radiant flux shall not be less than Class I in Groups I-1, I-2, and I-3 and not less than Class II in Groups A, B, E, H, I- 4, M, R-1, R-2, and S.



Exception: Where a building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2, Class II materials are permitted in any area where Class I materials are required and materials complying with DOC FF-1 "pill test" (CPSC 16 CFR, Part 1630) or with ASTM D 2859 are permitted in any area where Class II materials are required.

CHANGE SIGNIFICANCE: Primarily, this revision will clarify how the "critical radiant flux" requirements are to be applied to floor finishes in rooms or spaces that are not separated from corridors by full-height partitions. Looking at the wording that has been deleted in Section 804.4 will show that for "rooms or spaces not separated from corridors by full-height partitions extending from the floor to the underside of the ceiling," they were expected to comply with the requirements of the previously existing Section 804.4.1. However, once a nser looked at Section 804.4.1, that text did not distinguish how the spaces that were open to the corridor were regulated because the provisions only addressed exit enclosures, exit passageways, and corridors. The new language clarifies that the rooms or spaces that are not separated from the corridor need to meet the same requirements as those for the corridor. From a flame spread requirement standpoint, it is logical that these open rooms or spaces need to meet the same requirements as the corridors from which they are not separated.

These revisions do not have as broad an application as what it may seem when first reading the requirements. Based on the scoping of Section 804.1 and the exception to that section, it is clear that "traditional-type" floor finishes are not regulated and that the requirements only apply to materials that are comprised of fibers. Traditional finish floors and floor coverings, such as wood flooring and resilient floor coverings, have not proved to present an unusual hazard and are known to pass the "pill test"; they are thus exempted by the exception in Section 804.1.

Within the United States, the revisions to this section will not change the way the provisions are enforced or impose any additional requirements. All carpets and carpet-like floor materials have been regulated by the federal government and have been required to comply with the pill test since the 1970s. Therefore, all U.S. carpeting materials are tested and regulated through this process. The revisions to this section have added a referenced standard, ASTM D 2859, that is an equivalent test standard and could be used internationally where the pill test may not be used.

CHANGE TYPE: Modification

CHANGE SUMMARY: Automatic sprinkler systems are now required in occupancies where upholstered furniture or mattresses are manufactured, stored, or displayed.

903.2.4, 903.2.7, 903.2.9

Furniture Storage and Display in Group F-1, M, and S-1 Occupancies

2012 CODE: 903.2.4 Group F-1. An automatic sprinkler system shall be provided throughout all buildings containing a Group F-1 occupancy where one of the following conditions exists:

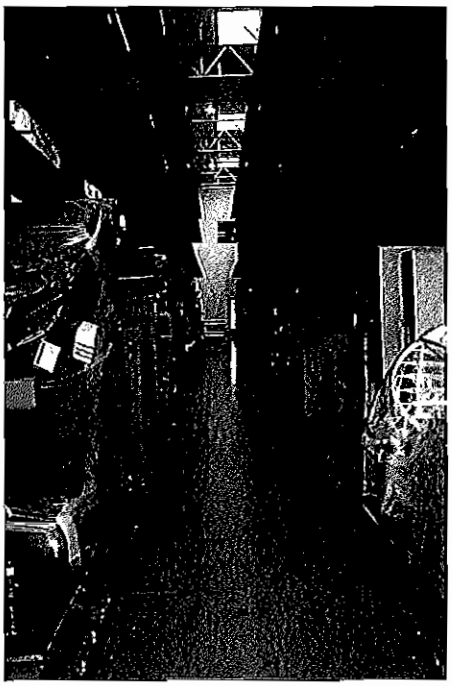
1. A Group F-1 fire area exceeds 12,000 square feet (1115 m^2).
2. A Group F-1 fire area is located more than three stories above grade plane.
3. The combined area of all Group F-1 fire areas on all floors, including any mezzauines, exceeds 24,000 square feet (2230 m^2).
4. A Group F-1 occupancy used for the manufacture of upholstered furniture or mattresses exceeds 2,500 square feet (232 m^2).

903.2.7 Group M. An automatic sprinkler system shall be provided throughout buildings containing a Group M occupancy where one of the following conditions exists:

1. A Group M fire area exceeds 12,000 square feet (1115 m^2).
2. A Group M fire area is located more than three stories above grade plane.
3. The combined area of all Group M fire areas on all floors, including any mezzanines, exceeds 24,000 square feet (2230 m^2).
4. A Group M occupancy area used for the display and sale of upholstered furniture or mattresses exceeds 5,000 square feet (464 m^2).

903.2.9 Group S-1. An automatic sprinkler system shall be provided throughout all buildings containing a Group S-1 occupancy where one of the following conditions exists:

1. A Group S-1 fire area exceeds 12,000 square feet (1115 m^2).
2. A Group S-1 fire area is located more thau three stories above grade plane.
3. The combined area of all Group S-1 fire areas on all floors, including any mezzauines, exceeds 24,000 square feet (2230 m^2).
4. A Group S-1 fire area used for the storage of commercial trucks or buses where the fire area exceeds 5,000 square feet (464 m^2).
5. A Group S-1 occupaucy used for the storage of upholstered furniture or mattresses exceeds 2,500 square feet (232 m^2).



International Code Council®

Storage area containing upholstered furniture

903.2.4, 903.2.7, 903.2.9 continued

regardless of fire area size. The provision was not tied to the amount or height of furniture storage and it was unclear whether the requirement could be applied to bedding such as mattresses or box springs. Mattresses and box springs are not considered to be "upholstered furniture" under current Consumer Products Safety Commission regulations found in 16 CFR Part 1633, which is a performance standard that measures the ignition resistance of mattresses. Therefore, further refinement was deemed necessary for the requirement to be effective.

New limits have now been established for the presence of upholstered furniture and mattresses in Group F-1, M, and S-1 occupancies. Sections 903.2.4 and 903.2.9 addressing Group F-1 and Group S-1 occupancies, respectively, now establish a threshold of 2500 square feet for the storage or manufacturing of upholstered furniture and mattresses. In Group M occupancies, Section 903.2.7 establishes a threshold of 5000 square feet. These floor area values are arbitrary but are intended to reduce the burden on the regulated businesses while providing reasonable thresholds as to when automatic sprinkler protection is required.

The requirements in Section 903.2.4, 903.2.7, and 903.2.9 are tied to the floor area devoted to the manufacture, display, or storage of upholstered furniture rather than building fire area. Jurisdictions may want to develop some type of policy on these provisions because the exceptions all are tied to the area "used for" manufacturing, display, sale, or storage of the upholstered furniture or mattresses. The code does not clearly state how the storage or display area's size and quantity of the materials are to be measured. For example, can the occupancy have multiple areas within it, provided each area is below the size threshold, or would a single sofa in a large retail store trigger the requirements? Using a Group M occupancy in a nonsprinklered 11,000-square-foot space as an example, is it permissible to divide the display and storage of upholstered furniture or mattresses into areas of 4,900 square feet, each separated by exit access aisles and consider that each area is beneath the 5,000-square-foot threshold? Or, on the other hand, could a siugle piece of upholstered furniture in the store trigger the requirement because the store itself is over the area limitation? Jurisdictions should consider these scenarios and develop a policy to address how the floor area and quantity of the materials will be measured for the purpose of applying these requirements to determine when automatic sprinkler protection is required.

Another consideration when applying these provisions is the height of storage. Upholstered furniture or mattresses are commonly classified as high-hazard commodities in accordance with IFC Chapter 32 because they commonly are composed of large amounts of expanded Group A plastics. If the height of storage exceeds 6 feet and the area of storage exceeds 500 square feet in buildings accessible to the public or 2500 square feet in buildings that are not accessible to the public, IFC Table 3206.2 requires automatic sprinkler protection designed and installed in accordance with Section 903.3.1.1.

903.2.11.1.3

Sprinkler Protection for Basements

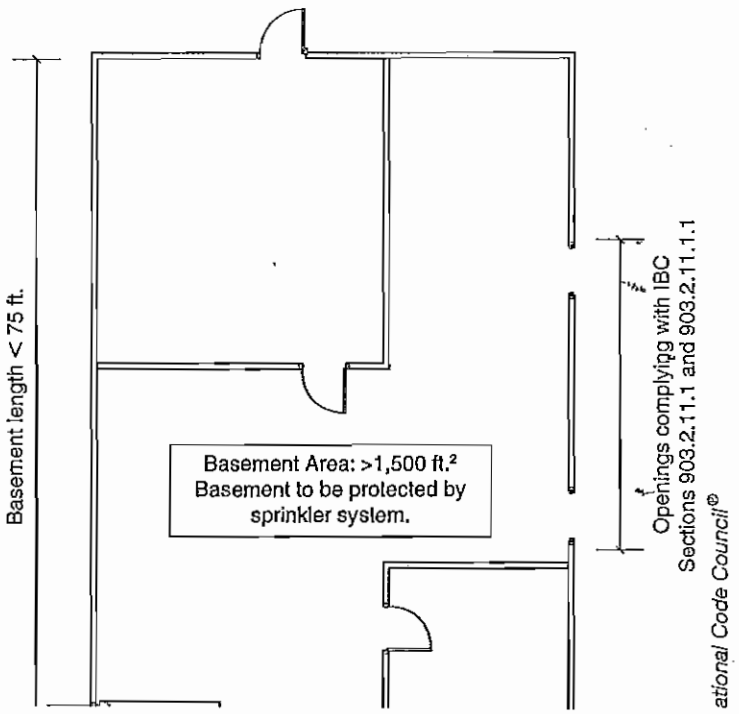
CHANGE TYPE: Modification

CHANGE SUMMARY: Basements provided with walls, partitions, or fixtures that can obstruct water from hose streams now require automatic sprinkler protection.

2012 CODE: 903.2.11.1.3 Basements. Where any portion of a basement is located more than 75 feet (22 860 mm) from openings required by Section 903.2.11.1, or where walls, partitions, or other obstructions are installed that restrict the application of water from hose streams, the basement shall be equipped throughout with an approved automatic sprinkler system.

CHANGE SIGNIFICANCE: Interior structural firefighting is a high-risk operation for firefighters. Numerous complications can arise when commencing an interior fire attack, including (but not limited to), problems with the water supply, protective clothing, breathing apparatus, or the structure. One area of buildings that can complicate interior firefighting is basements. IBC Section 202 defines a basement as a *story that is not a story above grade plane*. Basements can be partially or completely underground. Basements present some of the more challenging complications for firefighters because entering the area is analogous to entering a building through the chimney of a fireplace. All of the heat will collect at the highest point, which can be the entry doorway into the basement, so firefighters must push their way through these fire gases

903.2.11.1.3 continues



903.2.11.1.3 continued before commencing the application of water. Basements almost always contain building load-bearing elements so a fire involving this area can adversely affect structural stability when the area is involved in fire.

One concern during interior firefighting operations is obstruction of fire streams. Obstructions such as walls or partitions may prevent the application of water onto the area of fire involvement. The installation of an automatic sprinkler system in basements over 1500 square feet in floor area is now required when obstructions such as walls, partitions or similar elements are introduced which could obstruct the application of hose streams. It should be noted that whether the wall contains door openings or not has no effect on the application of the provision. While some code requirements such as exit access travel distance (Section 1016) and the location of Class II standpipes (Section 905.5) allow measuring along an available route through the building and through doors, the presence of doorways has no bearing on the code's application. Because a wall of any size has the potential to "restrict the application of water," the building official should be consulted if the design indicates anything other than a wide-open, unfurnished space and sprinklers are not intended to be installed.

CHANGE TYPE: Modification

CHANGE SUMMARY: The smoke alarm interconnection requirements are now applicable to Group I-1 occupancies and include allowances for use of wireless alarms.

2012 CODE: 907.2.11.3 Interconnection. Where more than one smoke alarm is required to be installed within an individual dwelling unit or sleeping unit in Group ~~R-1, R-2, R-3 or R-4~~ R or I-1 occupancies, the smoke alarms shall be interconnected in such a manner that the activation of one alarm will activate all of the alarms in the individual unit. Physical interconnection of smoke alarms shall not be required where listed wireless alarms are installed and all alarms sound npon activation of one alarm. The alarm shall be clearly audible in all bedrooms over background noise levels with all intervening doors closed.

CHANGE SIGNIFICANCE: The addition of the Group I-1 occupancy classification helps coordinate the IBC provisions with requirements that have previously existed within both the IFC and the *International Existing Building Code* (IEBC). In addition, the provisions now recognize the use of listed wireless smoke alarms. Listed wireless alarms are now permitted to substitute for wired interconnection of the smoke alarms in both new and existing construction. Some building officials have previously accepted these wireless alarms as acceptable alternatives because they met the intent of ensuring that all of the alarms would sound if one detector were activated. It is now clear that listed wireless smoke alarms do comply with the code.

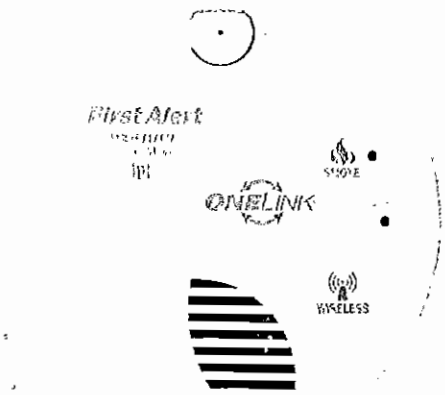
In addition to this change in the IBC, similar requirements can now be found in the IRC, IFC, and IEBC for both new and existing buildings to allow the installation of wireless smoke alarms. All wireless smoke alarms are listed to UL 217, *Single and Multiple Station Smoke Alarms*, and are classified by NFPA 72 as low-power systems.

All of the devices available in the marketplace utilize a single smoke alarm that serves as the "host" device that is wirelessly connected to the "guest" smoke alarms in the dwelling and sleeping spaces. The master smoke alarm may be wired to a 120-volt AC branch circuit, or it may be battery powered. In IBC-regulated new construction, the "host" device is required to be wired into a branch circuit receiving electrical energy from a commercial source (see Section 907.2.11.4). Wiring is no longer required to interconnect the additional "guest" smoke alarms. The "guest" smoke alarms are battery powered.

NFPA 72 Section 23.18 reqnires the "host" device supervise all the "guest" smoke alarms. Required supervisory signals include loss or depletion of battery power in the "guest" smoke alarms and the integrity of the signal frequency and path interconnecting all of the devices. Before a battery reaches a power level that can render a smoke alarm inoperable, or in the event of a failure of the communications path, NFPA 72 requires that an audible and visual snpervisory signal be transmitted and annunciated so it can be identified and repaired. NFPA 72 specifies a maximum

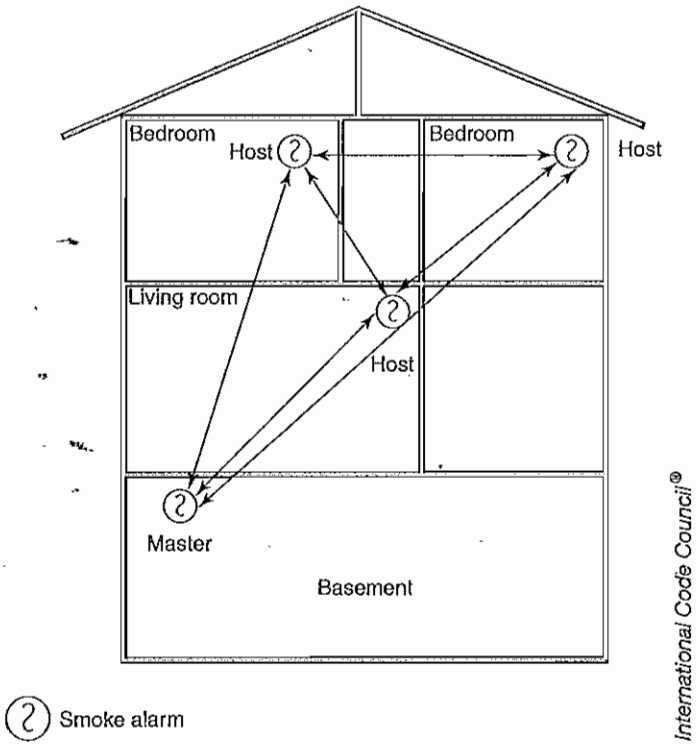
907.2.11.3

Wireless Interconnection of Smoke Alarms



Wireless smoke alarm *(Courtesy of BRK Electronics, Aurora IL)*

907.2.11.3 continued



Smoke alarm location and interconnection

function in accordance with NFPA 72. The response time between a smoke alarm's activation and the transmission of a signal that causes the interconnected alarms to activate cannot exceed 20 seconds.

NFPA 72 requires that wireless low-power smoke alarms be capable of reliably communicating at a distance of 100 feet inside dwellings. The particular test method specified in NFPA 72 is based on the system's ability to attenuate (transmit and receive) a wireless radio-frequency signal inside of a Type V building with four walls and two floors constructed of wood, gypsum wallboard, and plywood and a floor covered with tile. In systems where smoke and carbon monoxide alarms are wirelessly interconnected, NFPA 72 requires the fire alarm signal take precedence over other alarm signals. The wireless smoke alarm that initiates an alarm signal must be manually reset to silence the audible alarm signal. Finally, a failure of any "guest" alarm cannot cause the loss of signal to other transceivers on the wirelessly monitored circuit. Depending on the design and listing, a single "host" smoke alarm may be capable of serving 12 to 18 "guest" smoke or CO alarms.

CHANGE TYPE: Addition

CHANGE SUMMARY: In new and existing buildings, carbon monoxide (CO) alarms are now required in Group R and I occupancies with fuel-burning appliances or attached garages.

2012 CODE: 908.7 Carbon Monoxide Alarms. Group I or R occupancies located in a building containing a fuel-burning appliance or a building which has an attached garage shall be equipped with single-station carbon monoxide alarms. The carbon monoxide alarms shall be listed as complying with UL 2034 and be installed and maintained in accordance with NFPA 720 and the manufacturer's instructions. An open parking garage, as defined in Chapter 2, or enclosed parking garage ventilated in accordance with Section 404 of the *International Mechanical Code* shall not be considered an attached garage.

Exception: Sleeping units or dwelling units which do not themselves contain a fuel-burning appliance or have an attached garage, but which are located in a building with a fuel-burning appliance or an attached garage, need not be equipped with single-station carbon monoxide alarms provided that:

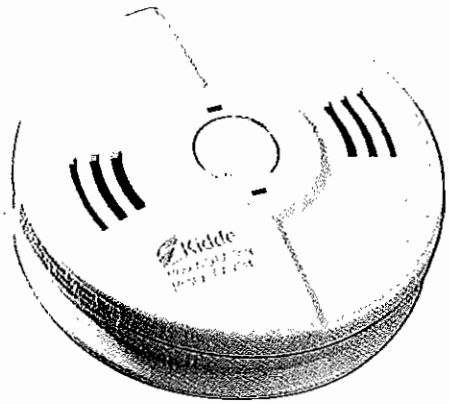
1. The sleeping unit or dwelling unit is located more than one story above or below any story that contains a fuel-burning appliance or an attached garage.
2. The sleeping unit or dwelling unit is not connected by ductwork or ventilation shafts to any room containing a fuel-burning appliance or to an attached garage.
3. The building is equipped with a common-area carbon monoxide alarm system.

908.7.1 Carbon Monoxide Detection Systems. Carbon monoxide detection systems, that include carbon monoxide detectors and audible notification appliances—installed and maintained in accordance with this section for carbon monoxide alarms and NFPA 720 shall be permitted. The carbon monoxide detectors shall be listed as complying with UL 2075.

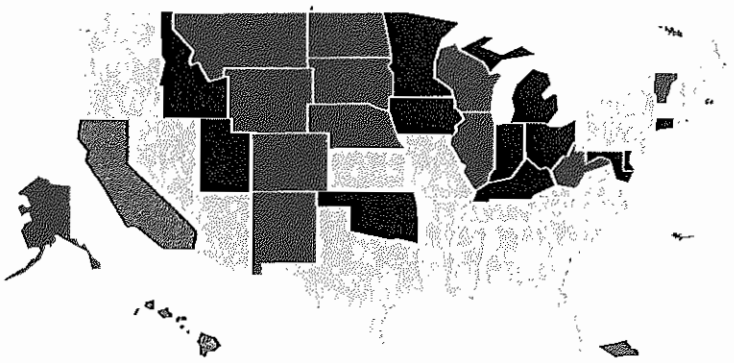
908.7 continues

908.7

Carbon Monoxide Alarms



Carbon monoxide alarm *(Courtesy of UTC Fire and Home Security, Mebane NC)*



< 30 deaths/100,000 residents

30-59 deaths/100,000 residents

908.7 continued

Chapter 35

NFPA. 720-2005, *Standard for the Installation of Carbon Monoxide (CO) Warning Equipment in Dwelling Units*

UL. 2034-2008, *Standard for Single and Multiple Station Corbon Monoxide Alarms*

CHANGE SIGNIFICANCE: Section 908.7 contains new requirements for carbon mouoxide detectors in all residential (Group R) and institutioual (Group I) occupancies. These provisions apply to new construction, and a similar requirement was added into the IFC to deal with existing buildings.

Carbon monoxide (CO) detectors were first required by the 2009 IRC for all one- and two-family dwellings. Technical data in a 1998 article published by the *Journal of the American Medical Association (JAMA)* was the basis of the decision to first mandate CO detectors. This particular paper stated that approximately 2100 deaths occur annually as a result of CO poisoning. That annual number is based on the findings of a paper prepared by the U.S. Department of Health, Centers for Disease Control and Preveution (CDC).[1] The referenced paper documeuted epidemiological research by two CDC physicians who examined 56,133 death certificates over a 10-year period. When the researchers excluded suicides, homicides, structure fires, and deaths resulting from CO poisoniug in motor vehicles, the death rate steadily decreased for the sample period, from a value of 1513 people in 1979 to 878 in 1988.

Section 908.7 now requires the installation of a CO alarm in any new Group I or R occupancy when it contains a fuel-burning appliance or it has an attached garage. CO alarms are not required in open or enclosed parking garages as defined by the IBC. The exception indicates a single-station CO alarm is not required iu each sleeping or dwelling unit where they are located more than one story above or below the floor or level housing the fuel-burning appliance or an attached garage and where there are no ducts or ventilation shafts that connect between the unit and the fuel-burning appliance or attached garage. However, in such a building, a common-area CO detection system is required. Such a system would be required to comply with the requirements of NFPA 72 and NFPA 720, *Standard for the Installation of Carbon Monoxide (CO) Warning Equipment in Dwelling Units,* including the installation of listed detectors and occupant notificatiou devices.

CO alarms installed in accordance with the IBC are listed in accordance with UL 2034, *Standard for Single and Multiple Station Carbon Monoxide Alarms.* They are designed to initiate an audible alarm when the level of CO is below that which can cause a loss of the ability to react to the dangers of CO exposure.

Unless listed as low-power wireless, CO alarms require a primary and secondary power supply. The primary power supply is utility power, and secondary power supply is typically a battery. NFPA 720 requires a CO alarm outside of each sleeping unit in the immediate vicinity of the bedroom and on every occupiable level of a dwelling, including basements. CO alarms are not reqnired in attics or crawl spaces. When a combinatiou CO/smoke alarm is provided, the fire alarm signal takes precedence over any other alarm signals. NFPA 720 requires the CO alarm be capable of transmitting a distinct audible signal that is different than the smoke alarm signal.

In jurisdictions adopting the 2012 IFC, retroactive provisions in IFC Secion 1103.9 are applicable to existing buildings classified as Group I or R.

1005

Means of Egress Capacity Determination

CHANGE TYPE: Modification

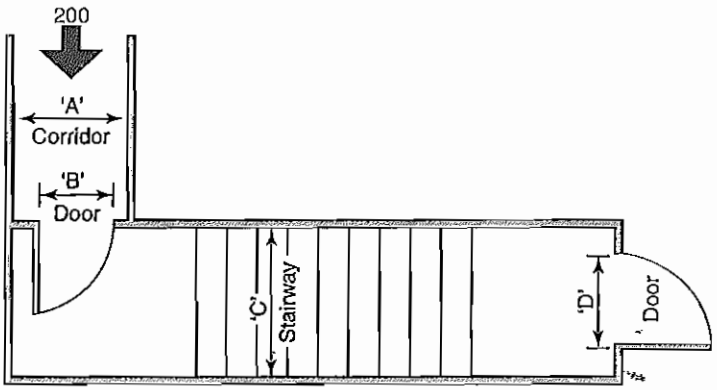
CHANGE SUMMARY: Reduced exit width factors have been established for sprinklered buildings provided with an emergency voice/alarm communication system, and the exit width/capacity requirements are now presented in a more logical and organized layout.

2012 CODE: ~~**1004.4 Exiting From Multiple Levels.** Where exits serve more than one floor, only the occupant load of each floor considered individually shall be used in computing the required capacity of the exits at that floor, provided that the exit capacity shall not decrease in the direction of egress travel.~~

~~**1004.5 Egress Convergence.** Where means of egress from floors above and below converge at an intermediate level, the capacity of the means of egress from the point of convergence shall not be less than the sum of the two floors.~~

~~**1005.1 Minimum Required Egress Width.** The means of egress width shall not be less than required by this section. The total width of means of egress in inches (mm) shall not be less than the total occupant load served by the means of egress multiplied by 0.3 inch (7.62 mm) per~~

1005 continues



Example : Assuming exit is serving 200 people

Component	Min width based on component (1005.2)	Min width based on occupant load (1005.3)	
		General[1]	Sprinklered building with EV/ACS[2]
Corridor 'A'	44"	40"	30"
Door 'B'	32"	40"	30"
Stairway 'C'	44"	60"	40"
Door 'D'	32"	40"	30"

1. Building without sprinkler system or EV/ACS; (also includes

1005 continued

~~occupant for stairways and by 0.2 inch (5.08 mm) per occupant for other egress components. The width shall not be less than specified elsewhere in this code. Multiple means of egress shall be sized such that the loss of any one means of egress shall not reduce the available capacity to less than 50 percent of the required capacity. The maximum capacity required from any story of a building shall be maintained to the termination of the means of egress.~~

Exception: ~~Means of egress complying with Section 1028.~~

1005.1 General. All portions of the means of egress system shall be sized in accordance with this section.

Exception: Means of egress complying with Section 1028.

1005.2 Minimum Width Based on Component. The minimum width, in inches, of any means of egress components shall not be less than that specified for such component elsewhere in this code.

1005.3 Required Capacity Based on Occupant Load. The required capacity, in inches, of the means of egress for any room, area, space, or story shall not be less than that determined in accordance with the following:

1005.3.1 Stairways. The capacity, in inches, of means of egress stairways shall be calculated by multiplying the occupant load served by such stairway by a means of egress capacity factor of 0.3 inches (7.62 mm) per occupant. Where stairways serve more than one story, only the occupant load of each story considered individually shall be used in calculating the required capacity of the stairways serving that story.

Exception: For other than Group H and I-2 occupancies, the capacity, in inches, of means of egress stairways shall be calculated by multiplying the occupant load served by such stairway by a means of egress capacity factor of 0.2 inches (5.1 mm) per occupant in buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2 and an emergency voice/alarm communication system in accordance with Section 907.5.2.2.

1005.3.2 Other Egress Components. The capacity, in inches, of means of egress components other than stairways shall be calculated by multiplying the occupant load served by such component by a means of egress capacity factor of 0.2 inches (5.08 mm) per occupant.

Exception: For other than Group H and I-2 occupancies, the capacity, in inches, of means of egress components other than stairways shall be calculated by multiplying the occupant load served by such component by a means of egress capacity factor of 0.15 inches (3.8 mm) per occupant in buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2 and an emergency voice/alarm communication system in

1005.4 Continuity. The capacity of the means of egress required from any story of a building shall not be reduced along the path of egress travel until arrival at the public way.

1005.5. Distribution of Egress Capacity. Where more than one exit, or access to more than one exit, is required, the means of egress shall be configured such that the loss of any one exit, or access to one exit, shall not reduce the available capacity to less than 50 percent of the required capacity.

~~**1004.5**~~ **1005.6 Egress Convergence.** Where the means of egress from stories above and below converge at an intermediate level, the capacity of the means of egress from the point of convergence shall not be less than the sum of the required capacities for the two adjacent stories.

Provisions in 2009 IBC Sections 1005.2 and 1005.3 regulating permissable encroachment of doors also have been reformatted as new Section 1005.7.

CHANGE SIGNIFICANCE: The multiple requirements related to egress width that were previously contained in a single paragraph in Section 1005.1 have been reorganized and clarified, and the related provisions from Section 1004.4 and 1004.5 have been relocated to a more logical location with the other egress width/capacity provisions.

In addition, the reduced egress width factors for sprinklered buildings that had been in the 2000 through 2006 IBC but were removed in the 2009 edition have been reintrodnced. The exceptions allow for use of reduced width factors for sprinklered buildings but only where an emergency voice/communications alarm system (EV/ACS) is provided for the building.

The EV/ACS system provides the ability to communicate instructions to the occupants that could facilitate evacuation or relocation during a fire or other emergency. This additional information and direction could lead to more efficient nse of the egress system. Studies have shown that most people do not react to an initial alarm; therefore, requiring a voice alarm will increase safety by providing occupants with additional information about the emergency and evacuation.

The following list will help guide code users in finding the new location of the previous requirements and illustrate the editorial nature of this revision:

- Section 1005.1 provides a new charging paragraph and clarifies that it applies to all portions of the egress system.
- Section 1005.2 replaces the second sentence of the previous code's Section 1005.1 and notes that minimum width requirements for means of egress components may be specified in other locations in the code.
- Section 1005.3 provides the egress width factors in subsections that deal with the various types of components. Note the new exceptions in Sections 1005.3.1 and 1005.3.2 for sprinklered buildings that allow for a reduction in the minimum required calculated width.
- The provisions of the former Section 1004.4 have been incorporated

1005 continued

- Section 1005.4 replaces the last sentence of the previous code's Section 1005.1, and notes that once a minimum capacity is required along a means of egress, it must be provided along the entire path of egress travel.
- Section 1005.5 is consistent with the fourth sentence of the previous code's Section 1005.1.
- The "egress convergence" provisions from Section 1004.5 can now be found in Section 1005.6. This is basically an issue of egress capacity/width and is more appropriately located here, instead of within the code section regulating occupant load.
- Revisions have also been made in Sections 3404 and 3412 related to reduced egress width factors.

1008.1.2
Door Swing

CHANGE TYPE: Clarification

CHANGE SUMMARY: The occupant load used to determine the door swing requirement is not to be based on an assigned or distributed occupant load, but on the entire occupant load of the space served by the door.

2012 CODE: 1008.1.2 Door Swing. Egress doors shall be of the pivoted or side-hinged swinging.

Exceptions: (no changes to exceptions)

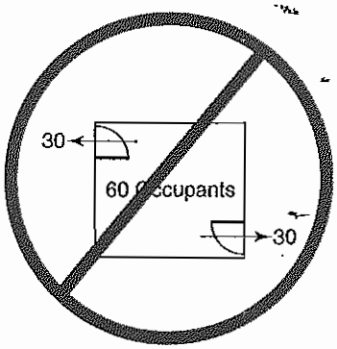
Doors shall swing in the direction of egress travel where serving a room or area containing an occupant load of 50 or more persons or a Group H occupancy.

CHANGE SIGNIFICANCE: The provision addressing door swing has been clarified to recognize that the total occupant load of the space is to be considered in the regulation of door swing direction. If the occupant load of the room or area is 50 or more persons, the egress doors must swing in the direction of travel. The previous language had occasionally been viewed as allowing a distributed or tributary occupant load to be used for determining the door swing. The additional text clarifies that it is not the code's intent to allow a distributed occupant load to be used for the determination of these basic minimum reqnirements.

To illustrate the difference in application, consider a space with an occnpant load of 60 people and two egress doors serving the area. The total occupant load of 60 should be considered when deciding that the doors serve an occupant load of 50 or more and need to swing in the direction of travel. It is not intended that the 60 occupants be distributed to the two doors so that each door is viewed as only serving 30 people and therefore able to swing against the direction of egress travel.

Most code users will see this as a clarification and not a technical modification. This new language reaffirms the long-standing intent and practice for this door swing requirement.

Doors required to swing in the direction of egress travel



A distributed or tributary occupant load is not used for determining door

1009, 1010, 202

Interior Stairways and Ramps

CHANGE TYPE: Clarification

CHANGE SUMMARY: Revisions have been made throughout the code to coordinate the provisions for unenclosed interior stairways and ramps that can be used as a portion of the means of egress.

2012 CODE:

202 Definitions.

EXIT. That portion of a means of egress system ~~which is separated from other interior spaces of a building or structure by fire-resistance-rated construction and opening protectives as required to provide a protected path of egress travel~~ between the exit access and the exit discharge or public way. Exits components include exterior exit doors at the level of exit discharge, ~~vertical exit enclosures~~ interior exit stairways, interior exit ramps, exit passageways, exterior exit stairways, and exterior exit ramps and horizontal exits.

EXIT ACCESS RAMP. An interior ramp that is not a required interior exit ramp.

EXIT ACCESS STAIRWAY. An interior stairway that is not a required interior exit stairway.

~~**EXIT ENCLOSURE.** An exit component that is separated from other interior spaces of a building or structure by fire-resistance-rated construction and opening protectives, and provides for a protected path of egress travel in a vertical or horizontal direction to the exit discharge or the public way.~~

INTERIOR EXIT RAMP. An exit component that serves to meet one or more means of egress design requirements, such as required number of exits or exit access travel distance, and provides for a protected path of egress travel to the exit discharge or public way.

INTERIOR EXIT STAIRWAY. An exit component that serves to meet one or more means of egress design requirements, such as required number of exits or exit access travel distance, and provides for a protected path of egress travel to the exit discharge or public way.

1009.1 General. Stairways serving occupied portions of a building shall comply with the requirements of this section.

1009.2 Interior Exit Stairways. Interior exit stairways shall lead directly to the exterior of the building or shall be extended to the exterior of the building with an exit passageway conforming to the requirements of Section 1023, except as permitted in Section 1027.1.

1009.2.1 Where Required. Interior exit stairways shall be included, as necessary, to meet one or more means of egress design requirements, such as required nnmber of exits or exit access travel distance.

1009.2.2 Enclosure. All interior exit stairways shall be enclosed in accordance with the provisions of Section 1022.

1009.3 Exit Access Stairways. Floor openings between stories created by exit access stairways shall be enclosed.

Exceptions:

1. In other than Group I-2 and I-3 occupancies, exit access stairways that serve, or atmospherically communicate between, only two stories are not required to be enclosed.
2. Exit access stairways serving and contained within a single residential dwelling uuit or sleeping unit in Group R-1, R-2, or R-3 occupancies are not required to be enclosed.
3. In buildings with only Group B or M occupancies, exit access stairway openings are not required to be enclosed provided that the buildiug is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, the area of the floor opening between stories does not exceed twice the horizontal projected area of the exit access stairway, and the opening is protected by a draft curtain and closely spaced sprinklers in accordance with NFPA 13.
4. In other than Groups B aud M occupancies, exit access stairway openings are not required to be enclosed provided that the buildiug is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, the floor opening does not connect more than four stories, the area of the floor opening between stories does not exceed twice the horizontal projected area of the exit access stairway, and the opening is protected by a draft curtain and closely spaced sprinklers in accordance with NFPA 13.
5. Exit access stairways within an atrium complying with the

serve only the parking garage are not required to be enclosed.

7. Stairways serving outdoor facilities where all portions of the means of egress are essentially open to the outside are not required to be enclosed.
8. Exit access stairways serving stages, platforms, and technical production areas in accordance with Sections 410.6.2 and 410.6.3 are not required to be enclosed.
9. Stairways are permitted to be open between the balcony, gallery, or press box and the main assembly floor in occupancies such as theaters, places of religious worship, auditoriums, and sports facilities.
10. In Group I-3 occupancies, exit access stairways constructed in accordance with Section 408.5 are not required to be enclosed.

1010.1 Scope. The provisions of this section shall apply to ramps used as a component of a means of egress.

Exceptions:

1. Other than ramps that are part of the accessible routes providing access in accordance with Sections 1108.2 through 1108.2.4 aud 1108.2.6, ramped aisles withiu assembly rooms or spaces shall conform with the provisions in Section 1028.11.
2. Curb ramps shall comply with ICC A117.1.
3. Vehicle ramps in parking garages for pedestrian exit access shall not be required to comply with Sections ~~1010.3~~ 1010.4 through ~~1010.9~~ 1010.10 when they are not an accessible route serving accessible parking spaces, other required accessible elements, or part of an accessible means of egress.

1010.2 Enclosure. All interior exit ramps shall be enclosed in accordance with the applicable provisions of Section 1022. Exit access ramps shall be enclosed in accordance with the provisions of Section 1009.3 for enclosure of stairways.

CHANGE SIGNIFICANCE: Although generally considered as a clarification of existing requirements, the multiple changes regarding interior stairways and ramps will provide for consistent application of the code requirements. Because so many code sections are affected by this change, including the revision of some of the basic means of egress terminology, it is important that code users are aware of the revisions even if they do not result in major technical changes.

Historically, the IBC has allowed the limited use of unenclosed exit stairs in a manner that has resulted in inconsistent interpretations. During previous code development cycles, numerous code changes were submitted, with some incorporated into the code, in order to clarify the intent and application of specific provisions. This new revision is considered as a comprehensive change that addresses the entire egress system and how unenclosed stairs affect issues such as exit versus exit access, travel distance measurements, contribution to the minimum number of required exits, etc.

To illustrate the need for a comprehensive revision, consider a two-story building that has one enclosed exit stairway and one open (unenclosed) stairway serving the second floor, which is required to have at least two exits. Because the open stairway did not meet the definition for an "exit," technically only one "exit" is provided from the second story even though the second stairway is permitted to be nnenclosed. In the same example, the correct means of measuring exit access travel distance was possibly confusing depending on whether or not the open stairway was considered as an "exit" stairway or an "exit access" stairway from the story.

Code users shonld be aware of these changes because they will affect means of egress terminology. In addition, modifications result in a number of substantial revisions to Sections 1009, 1010, 1016, 1021, and 1022 as well as sections in Chapters 4, 7, and 8, the IFC and IMC. It should be noted that these revisions are primarily a clarification and are intended to provide consistency throughout the code. The new and revised definitions and those sections that were revised within the code are based on the following concepts:

- All stairs within a building are elements of the means of egress system and must comply with Chapter 10.
- Unenclosed stairways are not considered as an *exit.*
- All exit stairways, to qualify as *exits,* must be enclosed with a fire-resistance-rated enclosure consisting of exit stair shafts and passageways based on the previous exit enclosure provisions.
- All stairways that are permitted to be open, or are not required stairways for egress purposes, are *exit access stairways.*
- *Exit access stairways* must be enclosed with fire-resistance-rated enclosures based on shaft provisions or may be open in accordance with exceptions based on the previous code exceptions.
- Exit access travel distance is measured from an entrance to an *exit.*
- Exit access travel distance includes the travel distance on an *exit access stairway.*
- Entrances to exits on each story are not mandatory and access to exits on other stories is permissible within certain limitations.

1012.2
Handrail Height

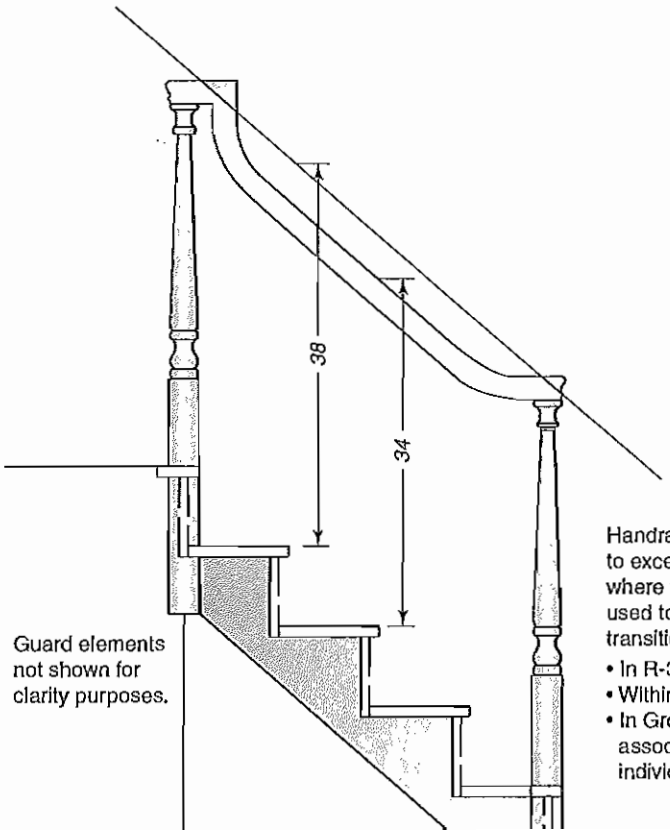
CHANGE TYPE: Modification

CHANGE SUMMARY: Transition pieces of a continuous handrail are now permitted to exceed the maximum permitted handrail height.

2012 CODE: 1012.2 Height. Handrail height, measured above stair tread nosings or finish surface of ramp slope, shall be uniform, not less than 34 inches (864 mm) and not more than 38 inches (965 mm). Handrail height of alternating tread devices and ship ladders, measured above tread nosings, shall be uniform, not less than 30 inches (762 mm) and not more than 34 inches (864 mm).

Exceptions:

1. When handrail fittings or bendings are nsed to provide continuous transition between flights the fittings or bendings shall be permitted to exceed the maximum height.
2. In Group R-3 occupancies, within dwelling units in Group R-2 occnpancies, and in Group U occupancies that are associated with a Gronp R-3 occupancy or associated with individual dwelling nnits in Group R-2 occnpancies, when handrail fittings or bendings are used to provide continuous



transition between flights, transition at winder treads, transition from handrail to guard, or when used at the start of a flight, the handrail height at the fittings or bendings shall be permitted to exceed the maximum height.

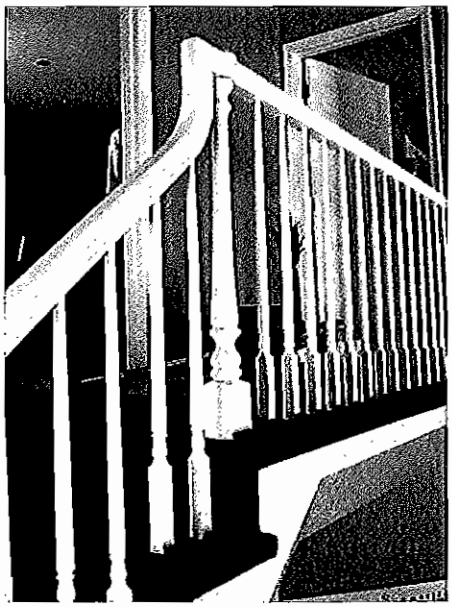
CHANGE SIGNIFICANCE: Fittings such as easings and gooseneck risers are commonly used features intended to provide rail continuity at locations where a straight transition is not possible. Incorporating such features is one means of complying with the provisions of Section 1012.4 (Continuity) and is now fairly common architectural and construction practice, especially within residential occupancies. The inclusion of the two new exceptions allows for a more stylized handrail design and permits the handrail heights on a flight of stairs to vary and exceed the height maximums at these transitions. The code previously has always required a "uniform" height for the handrail.

Depending on the proposed handrail height and guard height, the application of the permitted variation will probably be more common in residential occupancies at the locations mentioned in Exception 2. This is due to the fact that guard height on the open side of a stairway can be reduced down to handrail height. Therefore, if the combined handrail/guard on the stair were built at a 34-inch height, a transition would be needed to match up with a 36-inch minimum height guard on the landing. However, it should also be pointed out that if the combination handrail/guard on a stairway was built to a height of 36 inches or 38 inches, it could match up with a guard of a similar height at a landing, and there would be no need for the transition or the use of the exception. With the inclusion of a new Exception 1 in Section 1013.3, the lower guard height for specific residential occupancies will reduce the number of situations where these transitions may be needed. Please see the discussion addressing Section 1013.3 for additional commentary related to this change.

The need for these transition pieces is less of an issue for railings in commercial occupancies because the IBC requires a minimum 42-inch guard height on the open side of a stair as well as a 34 to 38-inch handrail height. Because separate handrails and guards are being provided, the need to transition from one height to another is less of an issue. A 42-inch minimum guard on a stair will easily match up with a similar height guard on a floor or landing without any transition being needed for the handrail.

These transitions are especially common where the handrail transitions from one flight of stairs to another at a dog-leg or switch-back stair landing. Although handrails are not typically required at the landing, the mandate for handrail extensions or for handrail continuity often creates the need for some type of transition, especially at turns. Previously, the height of a continuous handrail at these landings was not regulated. Therefore, the height of the handrail could transition rather abruptly as it transitioned from one stair flight to the next at the landing. The use of the new exceptions will permit a more gradual variation in the height even though it will allow for portions of the handrail to exceed the normal 38-inch maximum height—the belief being that a "continuous" handrail is more important than staying within the height limitation.

Exception 2 will differ from Exception 1 because it is limited to the



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Transition from handrail to guard

1012.3.1, 1012.8

Handrail Graspability and Projections

CHANGE TYPE: Modification

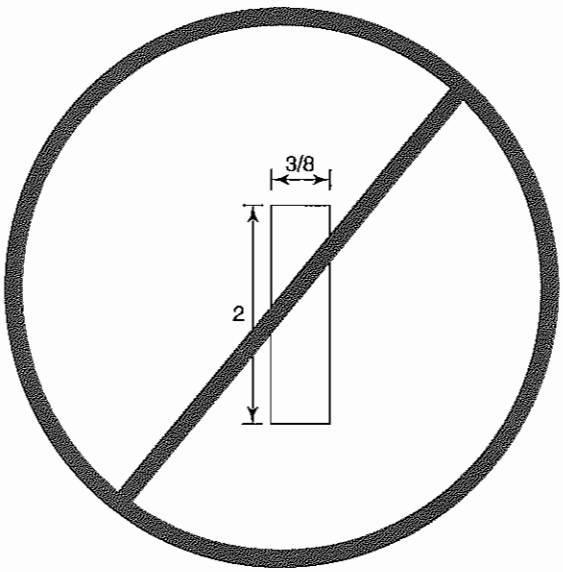
CHANGE SUMMARY: A minimum cross-section dimension has now been established for the graspability of noncircular Type I handrails.

2012 CODE: 1012.3 Handrail Graspability. All required handrails shall comply with Section 1012.3.1 or shall provide equivalent graspability.

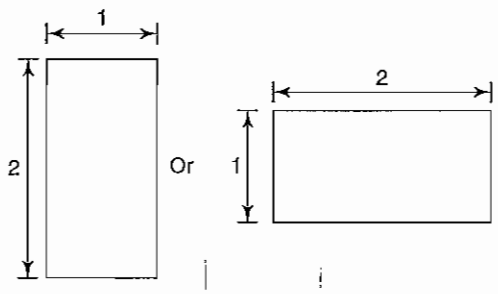
> **Exception:** In Group R-3 occupancies, within dwelling units in Group R-2 occupancies, and in Group U occupancies that are accessory to a Group R-3 occupancy or accessory to individual dwelling units in Group R-2 occupancies, handrails shall be Type I in accordance with Section 1012.3.1, Type II in accordance with Section 1012.3.2, or shall provide equivalent graspability.

1012.3.1 Type I. Handrails with a circular cross section shall have an outside diameter of at least 1¼ inches (32 mm) and not greater than 2 inches (51 mm). When the handrail is not circular, it shall have a perimeter dimension of at least 4 inches (102 mm) and not greater than 6¼ inches (160 mm) with a maximum cross-section dimension of 2¼ inches (57 mm) and minimum cross-section dimension of 1 inch (25 mm). Edges shall have a minimum radius of 0.01 inch (0.25 mm).

1012.8 Projections. On ramps, the clear width between handrails shall be 36 inches (914 mm) minimum. Projections into the required width of stairways and ramps at each ~~handrail~~ side shall not exceed 4½ inches



Not permitted



Perimeter dimension
- 4 in. minimum
- 6¼ in. maximum

Cross section
- 1 in. minimum

(114 mm) at or below the handrail height. Projections into the required width shall not be limited above the minimum headroom height required in Section ~~1009.2~~ 1009.5. Projections due to intermediate handrails shall not constitute a reduction in the egress width.

CHANGE SIGNIFICANCE: A minimum cross-section dimension has previously not been specified for Type I handrails that were not circular. A circular cross-section has historically been limited to a 1¼-inch minimum, but a minimum dimension has not been required of other handrail shapes, resulting in the acceptance of rails that may not allow a secure grip. The human hand gets its most secure grip on handrail cross sections that allow the hand to fit comfortably around the rail and do not require a pinching grip. While a handrail shape such as a ⅜-inch by 2-inch tube will fall within the code's previously specified dimensional requirements, the ability to grip the rail would be severely limited if the 2-inch dimension was oriented vertically.

While the same shaped section turned horizontally would be more comfortable and accommodating to the hand and grip of most users, there was no requirement that restricted the orientation to the horizontal position. In addition, the limited depth of the member would affect many users who tried to grasp it.

This requirement for a 1-inch minimum cross section when combined with the maximum dimension and the specified perimeter range will provide a shape that is more comfortable and accommodating to the hand's natural grasping shape. The 1-inch dimension was selected because it will allow the use of the maximum 2-inch cross section in one direction combined with the 1-inch dimension on the perpendicular axis and not exceed the maximum allowed 6¼-inch perimeter limitation.

The revisions to the projection provisions are intended to clarify the code's application and provide for more consistent enforcement. One change coordinates with the code language limiting the projection depth "at and below the handrail height." Because the item that protrudes the farthest may be a handrail, baluster, stringer, or an element of trim that is below the handrail, the provision now applies the limit to the "side" of the stair or ramp and is not limited to the handrail itself.

In addition, it has been clarified that an intermediate handrail on a stair or in an aisle is to be considered as a permitted projection and not as a reduction in the required egress width. For example the 48-inch aisle stairway required by Section 1028.9.1 that has a 2-inch-wide intermediate handrail would be viewed as providing 48 inches of egress width even though the aisle is arranged to provide 23 inches of clear width between the handrail and seating on both sides with the other 2 inches occupied by the handrail.

1013.1, 1013.8

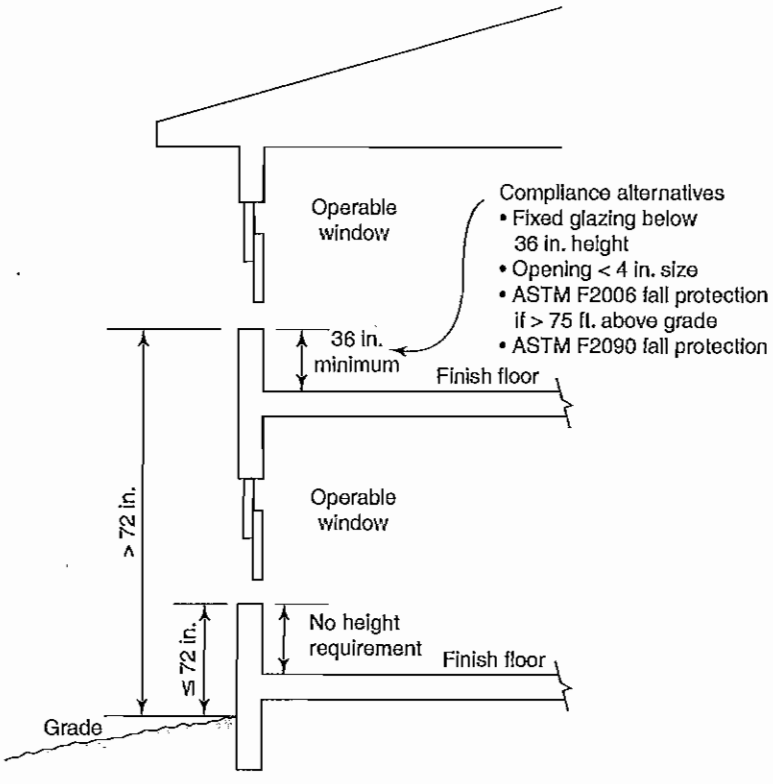
Guards at Operable Windows

CHANGE TYPE: Modification

CHANGE SUMMARY: The guard requirements for operable windows having a sill height more than 72 inches above the finished grade have been relocated from Chapter 14 to the general guard provisions of Chapter 10 and the minimum window sill height at which a guard is not required has been increased from 24 inches to 36 inches.

2012 CODE: **1013.1 General.** Guards shall comply with the provisions of Sections 1013.2 through 1013.7. Operable windows with sills located more than 72 inches (1.83 m) above finished grade or other surface below shall comply with Section 1013.8.

1013.8 ~~1405.13.2~~ Window Sills. In Occupancy Groups R-2 and R-3, one- and two-family and multiple-family dwellings, where the opening of the sill portion of an operable window is located more than 72 inches (1829 mm) above the finished grade or other surface below, the lowest part of the clear opening of the window shall be at a height not less than ~~24 inches (610 mm)~~ 36 inches (915 mm) above the finished floor surface of the room in which the window is located. ~~Glazing between the floor and a height of 24 inches (610 mm) shall be fixed or have openings through which a 4-inch (102 mm) diameter sphere cannot pass.~~ Operable sections of windows shall not permit openings that allow passage of a 4-inch (102-mm) diameter sphere where such openings are located within 36 inches (915 mm) of the finished floor.



Exceptions:

1. ~~Openings that are~~ Operable windows where the sill portion of the opening is located more than 75 feet (22.86 m) above the finished grade or other surface below and that are provided with window ~~guards~~ fall prevention devices that comply with ASTM F 2006 ~~or F 2090~~.
2. Windows whose openings will not allow a 4-inch (102-mm) diameter sphere to pass through the opening when the window is in its largest opened position.
3. Openings that are provided with window fall prevention devices that comply with ASTM F2090.
4. Windows that are provided with window opening control devices that comply with Section 1013.8.

1013.8.1 Window Opening Control Devices. Window openiug control devices shall comply with ASTM F 2090. The window opening control device, after operation to release the control device allowing the window to fully open, shall not reduce the minimum net clear opening area of the window unit to less than the area required by Section 1029.2.

CHANGE SIGNIFICANCE: The fall protection requirements related to low-height window sills have been relocated from Chapter 14 to Section 1013. In addition, the minimum height of the wiudow sill at which a guard is not required has been revised from 24 inches to 36 inches. The 36-inch sill height was chosen to reduce the ability of a child to climb onto the sill and thus enabling them to fall through the opening. While the 24-inch height was above the center of gravity for most children under 4½ years of age, the lower height was easily climbed by most standing children.

The modified Exception 1 makes two changes that better coordinate the code with the scope of the standard addressing window fall prevention devices. Most notable will be the fact that the exception is now limited to only those operable windows that are located more than 75 feet above grade. This revision is coordinated with the scoping provisions found within the ASTM F2006 standard itself. Section 1.2 of the standard states, "This safety specification applies only to window fall prevention devices that are to be nsed on windows that are not intended for escape (egress) and rescue (ingress)." Further, Section 1.3 states, "This safety specification applies only to devices intended to be applied to windows installed at heights of more than 75 above ground level in multiple-family dwelling buildings. This safety specification is not intended to apply to windows below 75 feet because all windows below 75 feet that are operable could be used as a possible secondary means of escape."

Users will also notice that the ASTM F2090 standard that was previously referenced has been deleted and is now addressed in a new Exception 3. With the revised height limitation in Exception 1 and the fact that emergency escape and rescue openings are not required above 75 feet, the ASTM F2090 standard is no longer applicable. ASTM F 2090 includes window fall prevention devices (the new Exception 3) and window opening control devices (Exception 4 and the new Section 1013.8.1).

1013.1 1013.8 continued

of grade and specifically allows for windows to be used for emergency escape and rescue. Opening control devices allow for normal operation to result in a 4 inch maximum opening, thus meeting the requirements of the last sentence in the base paragraph, but can be released to allow the window to be fully opened in order to comply with the emergency escape provisions of Section 1029.2. The window control devices and their operation are regulated by the new Section 1013.8.1 to ensure they can serve both the fall protection concerns as well as the escape and rescue opening functions.

The 4-inch opening size limitation specified in Exception 2 is consistent with the guard provisions of Section 1013.4. Although not stated directly within the exception, the requirements of Exception 2 are limited to windows or portions of windows where the opening is located between the floor surface and 36 inches in height above the floor surface. Due to the height limitations within the base paragraph of Section 1013.8, any opening that above the 36-inch height would not be regulated by the 4-inch limitation.

1013.3
Guard Height

CHANGE TYPE: Modification

CHANGE SUMMARY: The minimum required height for guards in Group R-3 occupancies and within individual Group R-2 dwelling units has been decreased from 42 inches to 36 inches.

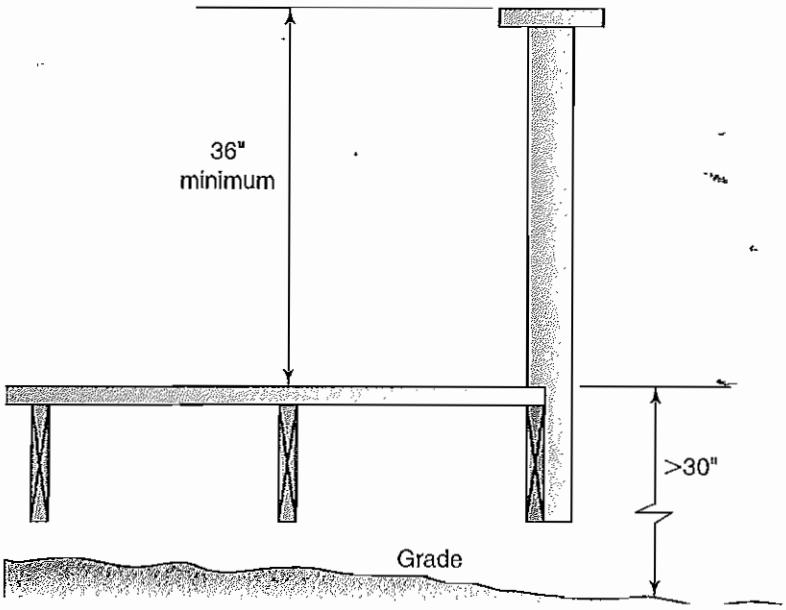
2012 CODE: 1013.3 ~~1013.2~~ Height. Required guards shall not be less than 42 inches (1067 mm) high, measured vertically ~~above the~~ as follows:

1. From the adjacent walking surfaces. ~~adjacent fixed seating or~~
2. On stairs, from the line connecting the leading edges of the tread ~~treads~~ nosings, and
3. On ramps, from the ramp surface at the guard.

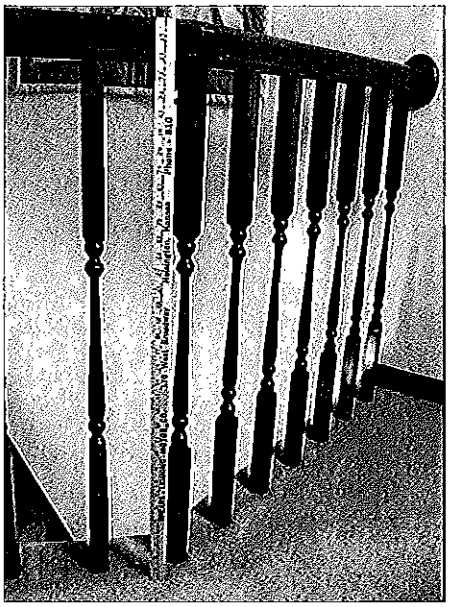
Exceptions:

1. For occupancies in Group R-3 not more than three stories above grade in height and within individual dwelling units in occupancies in Group R-2 not more than three stories above grade in height with separate means of egress, required guards shall not be less than 36 inches (914 mm) in height measured vertically above the adjacent walking surfaces or adjacent fixed seating.
2. ~~1.~~ For occupancies in Group R-3, and within individual dwelling units in occupancies in Group R-2, guards on the open sides of stairs shall have a height not less than 34 inches (864 mm) measured vertically from a line connecting the leading edges of the treads.

1013.3 continues



1013.3 continued



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Guard height for R-3 and within R-2 dwelling units

3.~~2.~~ For occupancies in Group R-3, and within individual dwelling units in occupancies in Group R-2, where the top of the guard also serves as a handrail on the open sides of stairs, the top of the guard shall not be less than 34 inches (864 mm) and not more than 38 inches (965 mm) measured vertically from a line connecting the leading edges of the treads.

4.~~3.~~ The guard height in assembly seating areas shall comply ~~be in accordance~~ with Section 1028.14.

5.~~4.~~ Along alternating tread devices and ship ladders, guards whose top rail also serves as a handrail shall have height not less than 30 inches (762 mm) and not more than 34 inches (864 mm), measured vertically from the leading edge of the device tread nosing.

CHANGE SIGNIFICANCE: The minimum required guard height for certain residential occupancies has been reduced from 42 inches to 36 inches in height in order to coordinate with existing provisions in the IRC. The exception is limited only to those listed residential occupancies located no more than three stories above grade. Previously the IBC required a 42-inch guard height for all occupancies. The 42-inch height was selected because the center of gravity for the 95th percentile male population (and about 97 percent of the total population) is below that height, and therefore, it was deemed unlikely that an accidental fall would occur from simply leaning over the rail. Although the lower guard height will address a lower percentage of the population, the reduced height has historically been recognized as acceptable under the IRC.

The reduction in required guard height for the floors and landings in residential units will help reduce the situations where a handrail fitting or bending addressed in the new exceptions to Section 1012.2 are applied. See the discussion of Section 1012.2 for more information on transitions between handrails or between a handrail and a guard.

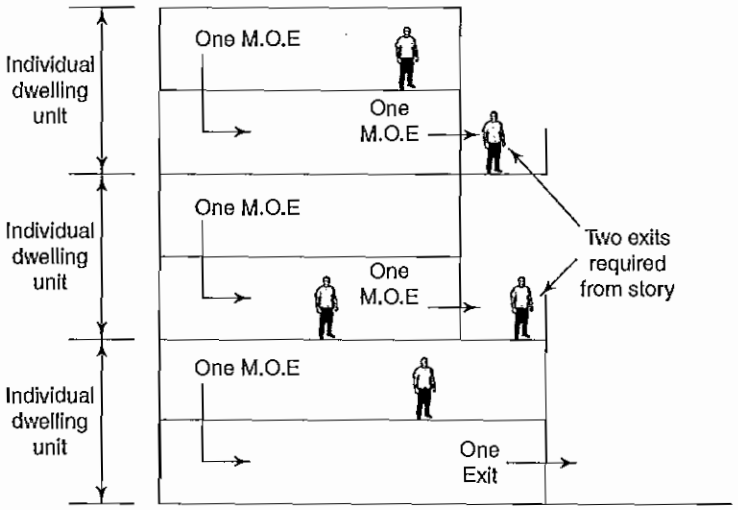
1021.2.3, Table 1021.2(1)

Exits from Dwelling Units

CHANGE TYPE: Modification

CHANGE SUMMARY: A new section clarifies when a single exit is permitted within or from an individual dwelling unit. Changes to Section 1021.2 and the tables will also provide a second option for compliance.

2012 CODE: ~~**1021.1**~~ **1021.2 Exits from Stories.** ~~All spaces within each story shall have access to the minimum number of approved independent exits as specified in Table 1021.1 based on the occupant load of the story. For the purposes of this chapter, occupied roofs shall be provided with exits as required for stories.~~



Single exit permitted within or from single-or multi-story dwelling unit if:
- Unit complies with 1015.1 as space with one means of egress, and
- Discharges directly to exterior at level of exit discharge, or
- Exit access outside unit provides access to not less than two exits

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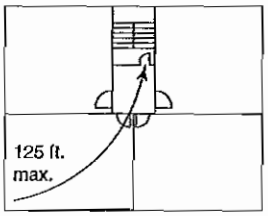
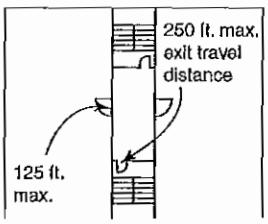
Egress from multistory dwelling units



R-2 Dwelling unit
Basement, first, second, or third story-single exit permitted from story and unit

- Maximum of 4 units
- 125 ft. max. travel distance
- 20 occupants maximum per unit (1015.1)



Access to two or more exits from story (1021.2.3 item 2)
- 250 ft. maximum exit travel distance

Single exit within and from unit
- No limits on number of units on story
- 125 ft. maximum common path of travel (Table 1014.3)
- 20 occupants maximum per unit (1015.1)

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Exceptions:

~~4. In Group R-2 and R-3 occupancies, one means of egress is permitted within and from individual dwelling units with a maximum occupant load of 20 where the dwelling unit is equipped throughout with an automatic sprinkler system in accordance with Sections 903.3.1.1 or 903.3.1.2.~~

Two exits, or exit access stairways or ramps providing access to exits, from any story or occupied roof shall be provided where one of the following conditions exists:

1. The occupant load or nnmber of dwelling units exceeds one of the values in Table 1021.2(1) or 1021.2(2).
2. The exit access travel distance exceeds that specified in Table 1021.2(1) or 1021.2(2) as determined in accordance with the provisions of Section 1016.1.
3. Helistop landing areas located on buildings or structures shall be provided with two exits, or exit access stairways or ramps providing access to exits.

Exceptions:

1. Rooms, areas and spaces complying with Section 1015.1 with exits that discharge directly to the exterior at the level of exit discharge, are permitted to have one exit.
2. Exception not shown for clarity
3. Exception not shown for clarity
4. Exception not shown for clarity
5. Individual dwelling units in compliance with Section 1021.2.3.
6. Exception not shown for clarity
7. Exception not shown for clarity

1021.2.3 Single-Story or Multi-Story Dwelling Units. Individual single-story or multi-story dwelling units shall be permitted to have a single exit within and from the dwelling unit provided that all of the following criteria are met:

1. The dwelling unit complies with Section 1015.1 as a space with one means of egress and
2. Either the exit from the dwelling unit discharges directly to the exterior at the level of exit discharge, or the exit access outside the dwelling unit's entrance door provides access to not less than two approved independent exits.

Because the code was substantially reformatted in Section 1021, only a portion of the 2009 code text is shown. See 2009 IBC Section 1021.1 for comparison.

CHANGE SIGNIFICANCE: The requirements for residential dwelling units include a nnmber of changes that affect both the egress requirements from

1021.2.3, Table 1021.2(1) continued

TABLE 1021.2(1) Stories with One Exit or Access to One Exit for R-2 Occupancies

Story	Occupancy	Maximum Number of Dwelling Units	Maximum Exit Access Travel Distance
Basement, first, second or third story	R-2[a, b]	4 dwelling units	125 feet
Fourth story and above	NP	NA	NA

For SI: 1 foot = 3048 mm.
NP – Not Permitted
NA – Not Applicable
a. Buildings classified as Group R-2 eqnipped throughout with an autometic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 and provided with emergency escape and rescue openings in accordance with Section 1029.
b. This Table is used for R-2 occupancies consisting of dwelling units. For R-2 occupaucies consisting of sleeping units, use Table 1021.2(2).

TABLE 1021.2(2) Stories with One Exit or Access to One Exit for Other Occupancies

Story	Occupancy	Maximum Occupants Story ~~(Or Dwelling Units) Per Floor And Travel Distance~~	Maximum Exit Access Travel Distance
First story or basement	A, B[bd], E[e], F[bd], M, U, S[bd]	49 occupants ~~and 75 feet travel distance~~	75 feet
	H-2, H-3	3 occupants ~~and 25 feet travel distance~~	25 feet
	H-4, H-5, I, R; R-1, R-2[a,c ~~e~~,f], R-4	10 occupants ~~and 75 feet travel distance~~	75 feet
	S[a]	~~29 occupants and 100 feet travel distance~~	100 feet
Second story	B[b], F, M, S[a]	29 occupants ~~and 75 feet travel distance~~	75 feet
	~~R-2~~	~~4 dwelling units and 50 feet travel distance~~	
~~Third story~~	~~R-2[c]~~	~~4 dwelling units and 50 feet travel distance~~	
Third story and above	NP	NA	NA

For SI: 1 foot = 304.8 mm.
NP – Not Permitted
NA – Not Applicable
~~a. For the required number of exits for parking structures, see Section 1021.1.2.~~
~~b. For the required number of exits for air traffic control towers, see Section 412.1.~~
a. ~~c.~~ Buildings classified as Gronp R-2 equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 and provided with emergency escape and rescue openings in accordance with Section 1029.
b. ~~d.~~ Group B, F, and S occnpancies in buildings eqnipped throughout with an antomatic sprinkler system in accordance with Section 903.3.1.1 shall have a maximum travel distance of 100 feet.
~~e. Day care occupancies shall have a maximum occupant load of 10.~~
c. This Table is used for R-2 occupancies consisting of sleeping units. For R-2 occupancies consisting of dwelling units, use Table 1021.2(1).

residential dwelling unit while others, such as those in Table 1021.2(1), apply only to Group R-2 dwelling units (not to Group R-2 sleeping units). One important aspect to note is that there are now two separate means of egress compliance options in these residential occupancies.

organize all of the provisions in a single location. The base paragraph refers to both single-story and multi-story dwelling units so it is clear that the provision can be applied to a multi-story unit even if it has an unenclosed exit access stairway as permitted by Section 1009.3, Exception 2.

Item 1 of Section 1021.2.3 and its reference to Section 1015.1 directs users to the two provisions for spaces with one exit or exit access including, (1) the 125 foot common path of travel limit from Section 1014.3 (referenced from Section 1015.1, Item 2) and (2) the occupant load limitation of 20 that is found in Exception 1 to Section 1015.1, Item 1. The second item addresses the code requirements for the means of egress after the occupant has left the individual dwelling unit. The two possible situations, (a) the occupant discharges directly to the exterior at the level of exit discharge, or (b) the occupant enters a common exit access which leads to at least two exits, are also addressed elsewhere in the code. If the person leaves the building, they are in the exit discharge and are considered safe because they are outside the building at ground level and have access to the public way. If the occupant has left the dwelling unit and is not on the level of exit discharge, then the occupant is now continuing through the exit access portion of the building, and will generally require access to at least two exits from the point that the occupant traveled out of the dwelling unit. However, Section 1021.2 and Table 1021.2(1) will provide another option where up to 4 dwelling units may be located on a story with access to only a single exit from the basement, first, second, or third story.

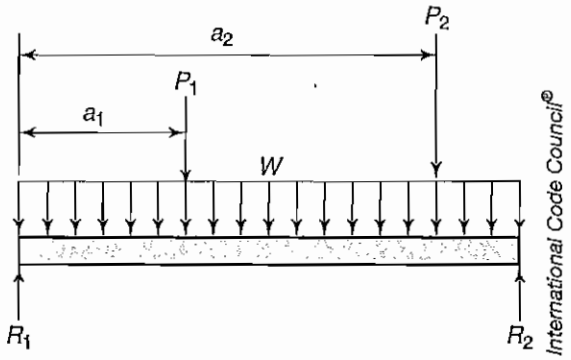
As mentioned previously, Section 1021.2 provides two options for exiting from the individual dwelling unit and the story of the building. These options are most clearly seen by comparing the requirements of Section 1021.2.3 (primarily item 2) with the general egress requirements that apply when using Sections 1015.1 and Table 1021.2(1). Table 1021.2(1) will allow a single exit from the basement, first, second, or third story if there are a maximum of 4 dwelling units with a limited travel distance; while Section 1021.2.3 can be used for any story (including the basement, first, second, or third) without a limitation on the number of units on the floor and a more generous travel distance limit. These two options are located in Section 1021.2 and the general egress requirements or in Exception 7 and its reference to Section 1021.2.3.

A second table to specifically address Group R-2 dwelling units continues the effort to clarify the application of the requirements for a single exit from a building or story (Section 1021) versus the requirements for egress from a space (Section 1015). Dividing the previous table into two tables addresses code modifications that have occurred over the past two editions that dealt with the common path of travel for sprinklered Group R-2 dwelling units. When the IBC was initially developed, not all residential occupancies were required to be sprinklered and as such a shorter common path of travel was imposed on the Group R-2 dwelling units. Splitting the tables allows for Table 1021.2(1) to address the requirements for Group R-2 dwelling units based on the number of units on the story while Table 1021.2(2) will regulate Group R-1, R-2 sleeping units and R-4 occupancies based on the number of occupants. Listing the individual residential occupancies also helps to clarify that Group R-3 occupancy buildings are always permitted to have a single exit (see Section 1021.2,

CHANGE TYPE: Modification

CHANGE SUMMARY: The live loads established in IBC Section 1607 and Table 1607.1 have been modified and updated in order to coordinate with the live loads of Chapter 4 and Table 4-1 in ASCE 7-10.

Table 1607.1
Minimum Live Loads



Simple beam load diagram

2012 CODE:

TABLE 1607.1 Minimum Uniformly Distributed Live Loads, L_o, and Minimum Concentrated Live Loads[g]

Occupancy or Use	Uniform (psf)	Concentrated (lb)
3. Armories and drill rooms	150[m]	—
4. Assembly areas ~~and theaters~~		
Fixed seats (fastened to floor)	60[m]	
Follow spot, projections, and control rooms	50	
Lobbies	100[m]	
Movable seats	100[m]	—
Stages ~~and floors~~	~~125~~ 150[m]	
Platforms (assembly)	~~125~~ 100	
Other assembly areas	100[m]	
5. Balconies ~~(exterior)~~ and decks[h]	Same as occupancy served	
~~6. Bowling alleys~~	~~75~~	—
~~7.~~ 6. Catwalks	40	300
~~9.~~ 8. Corridors, ~~except as otherwise indicated~~		
First floor	100	
Other floors	Same as occupancy served except as indicated	—
~~10. Dance halls and ballrooms~~	~~100~~	—
~~11~~ 9. Dining rooms and restaurants	100[m]	—
~~13.~~ 11. Elevator machine room grating (on area of ~~4 in²~~ 2 inches by 2 inches)	—	300
~~14.~~ 12. Finish light floor plate construction (on area of ~~1 in²~~ 1 inch by 1 inch)	—	200

Table 1607.1 continued

Occupancy or Use	Uniform (psf)	Concentrated (lb)
~~17. Grandstands (see stadium and arena bleachers)~~	—	—
~~18. Gymnasiums, main floors and balconies~~	~~100~~	—
~~19.~~ 15. Handrails, guards and grab bars	See Section 1607.8	
16. Helipads	See Section 1607.6	
~~22~~ 19. Libraries		
Corridors above first floor	80	1000
Reading rooms	60	1000
Stack rooms	150[b, m]	1000
~~23~~ 20. Manufacturing		
Heavy	250[m]	3000
Light	125[m]	2000
24. Recreational uses:		
Bowling alleys, poolrooms, and similar uses	75[m]	
Dance halls and ballrooms	100[m]	
Gymnasiums	100[m]	
Reviewing stands, grandstands, and bleachers	100[c, m]	
Stadiums and arenas with fixed seats (fastened to floor)	60[c, m]	
~~27.~~ 25. Residential		
One- and two-family dwellings		
Uninhabitable attics without storage[i]	10	
Uninhabitable attics with ~~limited~~ storage[l, j, k]	20	
Habitable attics and sleeping areas[k]	30	—
All other areas	40	
Hotels and multiple-family dwellings		
Private rooms and corridors serving them	40	
Public rooms[m] and corridors serving them	100	
~~28. Reviewing stands, grandstands and bleachers~~		~~Note c~~
~~29.~~ 26. Roofs:		
All roof surfaces subject to maintenance workers		300
Awnings and canopies:		
Fabric construction supported by a ~~lightweight rigid~~ skeleton structure	5 Nonreducible	
All other construction	20	
Ordinary flat, pitched, and curved roofs (that are not occupiable)	20	
Where primary roof members, are exposed to a work floor, at single panel points of lower chord of roof trusses, or any point along primary structural members supporting roofs:		
Over manufacturing, storage warehouses, and repair garages		2000
All other ~~occupancies~~ primary roof members		300
~~Roofs used for other special purposes~~	~~Note l~~	~~Note l~~
~~Roofs used for promenade purposes~~	~~60~~	
~~Roofs used for roof gardens or~~	~~100~~	

Occupancy or Use	Uniform (psf)	Concentrated (lb)
Occupiable roofs:		
Roof gardens	100	
Assembly areas	100[m]	
All other similar areas	Note l	Note l
~~32.~~ 29. Sidewalks, vehicular driveways, and yards, subject to trucking	250[d, m]	8000[e]
~~33. Skating rinks~~	~~100~~	—
~~34. Stadiums and arenas~~		
~~Bleachers~~	~~100[c]~~	—
~~Fixed seats (fastened to floor)~~	~~60[c]~~	
~~35.~~ 30. Stairs and exits		~~Note f~~
One- and two-family dwellings	40	300[f]
All other	100	300[f]
~~36.~~ 31. Storage warehouses (shall be designed for heavier loads if required for anticipated storage)		
Heavy	250[m]	—
Light	125[m]	
~~37.~~ 32. Stores		
Retail		
First floor	100	1000
Upper floors	75	1000
Wholesale, all floors	125[m]	1000
~~38.~~ 33. Vehicle barriers ~~systems~~	See Section 1607.8.3	
~~40.~~ 35. Yards and terraces, pedestrian	100 [m]	—

(Portions of table not shown are unchanged)

f. The minimum concentratad load on stair treads ~~(~~shall be applied on an area of ~~4 square~~ 2 inches by 2 inches~~)~~ ~~is 300 pounds~~. This load need not be assumed to act concurrently with the uniform load.

g. Where snow loads occur that are in excess of the design conditions, the structure shall be designed to support the loads due to the increased loads caused by drift buildup or a greater snow design determined by the bnilding official (see Section 1608). ~~For special-purpose roofs, see Section 1607.11.2.2.~~

i. Uninhabitable attics without storage are those where the maximum clear height between the joists and rafters is less than 42 inches, or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by by 24 inches in width, or greater, within the plane of the trusses. ~~For attics without storage,~~ This live load need not be assumed to act concurrently with any other live load requirements.

j. ~~For attics with limited storage and constructed with trusses, this live load need only be applied to those portions of the bottom chord~~ Uninhabitable attics with storage are those where the maximum clear height between the joists and rafters is 42 inchas or greater, or where there are two or more adjacent trusses with ~~the same~~ web configurations capable of ~~containing~~ accommodating an assumed rectangle 42 inches ~~high~~ in height by 24 inches ~~wide~~ in width, or greater, ~~located~~ within the plane of the trusses

~~The rectangle shall fit between the top of the bottom chord and the bottom of any other truss member, provided that each of the following criteria is met:~~ The live load need only be applied to those portions of the joists or trnss bottom chords where both of the following conditions are met:

i. The attic area is accessible ~~by a pull-dwon stairway or framed opening in accordance with Section 1209.2,~~ from an opening not less than 20 inchas in width by 30 inches in length that is located where the clear height in the attic is a minimum of 30 inches; and

ii. The slopes of the joists or truss ~~shall have a~~ bottom chords ~~pitch less than 2:12~~ are no greater than 2 units vertical to 12 units horizontal.

~~iii. Bottom chords of trusses shall be designed for the greater of actual imposed dead load or 10 psf, uniformly distributed over the entire span.~~ The remaining portions of the joists or bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 lb/ft^2.

k. Attic spaces served by ~~a fixed stair~~ stairways other than pull-down type shall be designed to support the minimum live load specified for habitable attics and sleeping rooms.

l. ~~Roofs used for other special purposes~~ Areas of occupiable roofs, other than roof gardens and assembly areas, shall be designed for ~~occupancies~~ loads as approved by the building official. Unoccupied landscaped areas of roofs shall be designed in accordance with

Table 1607.1 continued

CHANGE SIGNIFICANCE: Many live loads set forth in Chapter 4 of ASCE 7 were updated in the 2010 edition. To coordinate the changes in ASCE 7-10 with the 2012 IBC, corresponding modifications were made to Section 1607 and Table 1607.1. These changes are summarized as follows:

- Footnotes i, j, and k pertaining to residential attic live loads were updated to clarify the intent.
- The live load for stage floors was increased from 125 psf to 150 psf, and the live load for platforms in assembly areas was decreased from 125 psf to 100 psf.
- Various recreational type uses were consolidated under a new item called "recreational uses." These uses include bowling alleys, pool rooms, dance halls and ballrooms, gymnasiums, reviewing stands, grandstands and bleachers, and stadiums and arenas with fixed seats. No technical changes were made to the live loads. The factor, $f_1 = 1$ (See Section 1605.2.1) now applies to floors in places of public assembly areas and recreational uses for live loads in excess of 100 pounds per square foot. Skating rinks are deleted from Table 1607.1 because they are not listed in Table 4-1 of ASCE 7 and Table C4-1 of ASCE-7 specifies uniform live loads of 250 psf for ice skating rinks and 100 psf for roller skating rinks. Footnote m has been added to clarify that a live load reduction is not permitted nnless specific exceptions of Section 1607.9 apply. The footnote has been added at each specific use or occupancy in Table 1607.1 where a live load redncti on is restricted. With the addition of this footnote, Table 1607.1 clarifies limitations on live load reduction. References are added to Sections 1607.10.1 and 1607.10.2 to correlate with the footnote.
- The 300-pound concentrated load for stair treads has been relocated from footnote f to the table and the clarification is added that the 300-pound concentrated load need not act concurrently with the uniform load.
- New loading requirements for helipads have been added to Section 1607.6. (See a detailed discussion in the commentary to Section 1607.6.)
- The terminology associated with "occupiable roofs" has been clarified and coordinated with ASCE 7-10. Occupiable roof gardens and assembly areas have a live load of 100 psf. Occupiable roofs other than roof gardens and assembly areas must be designed for appropriate loads based on use or as required by the building official. Landscaped areas of roofs that are unoccupied must be designed for a live load of 20 psf plus the weight of the landscaping and saturated soil, which is considered a dead load.

1609, 202

Determination of Wind Loads

$$V_{asd} = V_{ult}\sqrt{0.6}$$

Equation 16-33, conversion of wind speed from V_{ult} to V_{ASD}

CHANGE TYPE: Modification

CHANGE SUMMARY: The wind design requirements of Section 1609 have been updated and coordinated with the latest wind load provisions in ASCE/SEI 7 (ASCE 7-10) and the wind load maps in the IBC are now based on ultimate design wind speeds, V_{ult}, which produce a strength level wind load similar to seismic load effects.

2012 CODE: The following are excerpted portions of the subject code text. The entire code change is not shown here for brevity.

202 Definitions.

HURRICANE-PRONE REGIONS. Areas vulnerable to hurricanes defined as:

1. The U. S. Atlantic Ocean and Gulf of Mexico coasts where the ~~basic~~ ultimate design wind speed, V_{ult}, for Risk Category II buildings is greater than 115 ~~90~~ mph (51.4 m/s).
2. Hawaii, Puerto Rico, Guam, Virgin Islands, and American Samoa.

WINDBORNE DEBRIS REGION. Areas within ~~Portions of~~ hurricane-prone regions located: ~~that are~~

1. Within 1 mile (1.61 km) of the coastal mean high water line where the ~~basic~~ ultimate design wind speed, V_{ult}, is 130 ~~110~~ mph (58 m/s) or greater; or
2. In areas ~~portions of hurricane-prone regions~~ where the ~~basic~~ ultimate design wind speed, V_{ult}, is 140 ~~120~~ mph (63.6 m/s) or greater; or Hawaii.

For Risk Category II buildings and structures and Risk Category III buildings and structures, except health care facilities, the windborne debris region shall be based on Figure 1609A. For Risk Category IV buildings and structures and Risk Category III health care facilities, the windborne debris region shall be based on Figure 1609B.

WIND SPEED, V_{ult}. Ultimate design wind speeds.

WIND SPEED, V_{ASD}. Nominal design wind speeds.

1609.1.1 Determination of Wind Loads. Wind loads on every building or structure shall be determined in accordance with Chapters ~~6~~ 26 to 30 of ASCE 7 or provisions of the alternate all-heights method in Section 1609.6. The type of opening protection required, the ~~basic~~ ultimate design wind speed, V_{ult}, and the exposure category for a site is permitted to be determined in accordance with Section 1609 or ASCE 7. Wind shall be assumed to come from any horizontal direction, and wind pressures shall be assumed to act normal to the surface considered.

Exceptions:

1. Subject to the limitations of Section 1609.1.1.1, the provisions of ICC 600 shall be permitted for applicable Group R-2 and R-3 buildings.
2. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of the AF&PA WFCM.
3. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of AISI S230.
4. Designs using NAAMM FP 1001.
5. Designs using TIA-222 for antenna-supporting structures and antennas, provided the extent of Topographic Category 2, escarpments, in Section 2.6.6.2 of TIA-222 shall extend 16 times the height of the escarpment.
6. Wind tunnel tests in accordance with ~~Section 6.6~~ Chapter 31 of ASCE 7~~, subject to the limitations in Section 1609.1.1.2~~.

The wind speeds in Figure 1609A, 1609B, and 1609C are ultimate design wind speeds, V_{ult}, and shall be converted in accordance with Section 1609.3.1 to nominal design wind speeds, V_{asd}, when the provisions of the standards referenced in Exceptions 1 through 5 are used.

~~**1609.1.1.2 Wind Tunnel Test Limitations.** The lower limit on pressures for main wind-force-resisting systems and components and cladding shall be in accordance with Sections 1609.1.1.2.1 and 1609.1.1.2.2.~~

~~**1609.1.1.2.1 Lower Limits on Main Wind-Force-Resisting System.** Base overturning moments determined from wind tunnel testing shall be limited to not less than 80 percent of the design base overturning moments determined in accordance with Section 6.5 of ASCE 7, unless specific testing is performed that demonstrates it is the aerodynamic coefficient of the building, rather than shielding from other structures, that is responsible for the lower values. The 80-percent limit shall be permitted to be adjusted by the ratio of the frame load at critical wind directions as determined from wind tunnel testing without specific adjacent buildings, but including appropriate upwind roughness, to that determined in Section 6.5 of ASCE 7.~~

~~**1609.1.1.2.2 Lower Limits on Components and Cladding.** The design pressures for components and cladding on walls or roofs shall be selected as the greater of the wind tunnel test results or 80 percent of the pressure obtained for Zone 4 for walls and Zone 1 for roofs as determined in Section 6.5 of ASCE 7, unless specific testing is performed that demonstrates it is the aerodynamic coefficient of the building, rather than shielding from nearby structures, that is responsible for the lower values. Alternatively, limited tests at a few wind directions without specific adjacent buildings, but in the presence of an appropriate upwind roughness, shall be permitted to be used to demonstrate that the lower pressures are due to the shape of the building and not to shielding.~~

1609 continued

1609.1.2 Protection of Openings. In windborne debris regions, glazing in buildings shall be impact resistant or protected with an impact-resistant covering meeting the requirements of an approved impact-resistant standard or ASTM E1996 and ASTM E1886 referenced herein as follows:

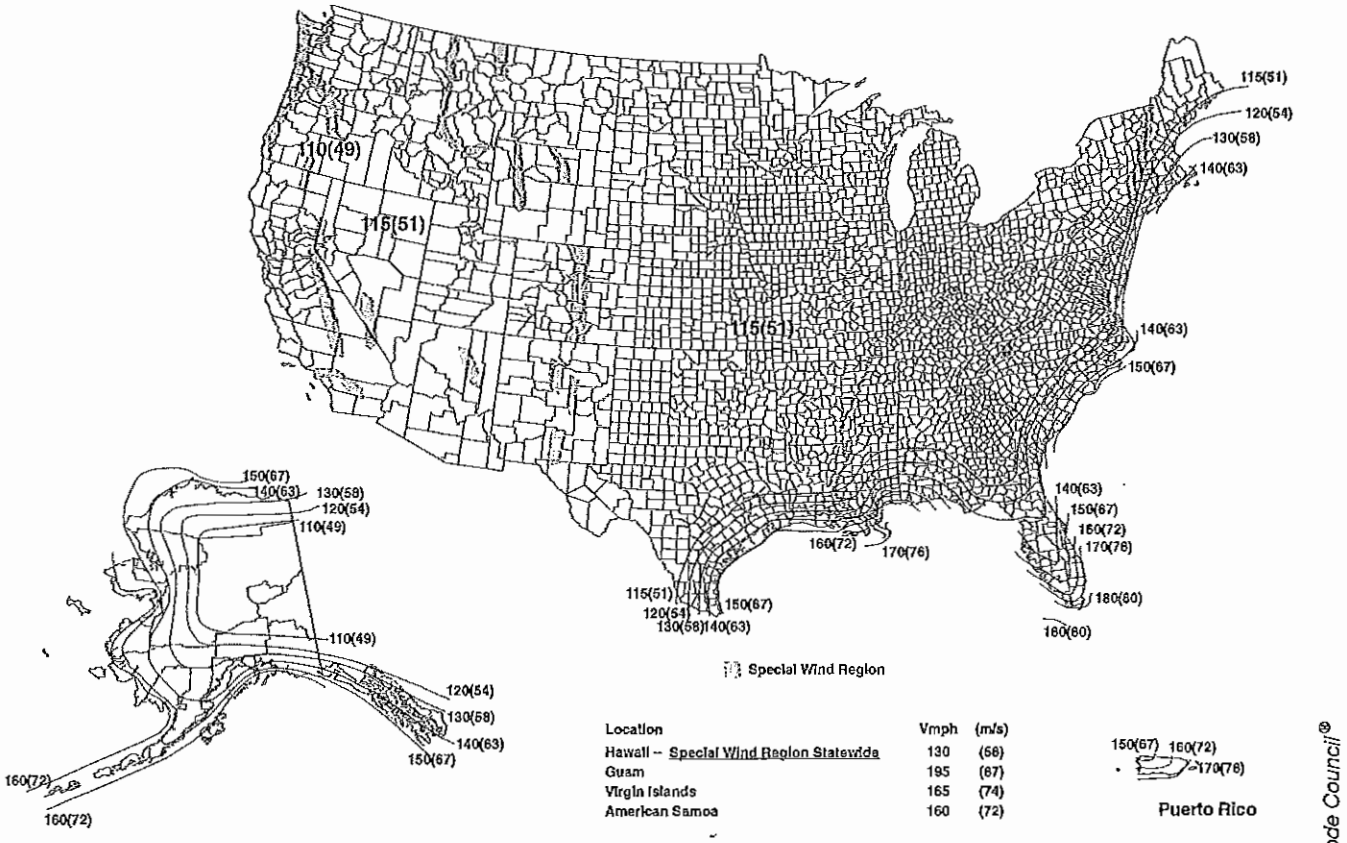
1. Glazed openings located within 30 feet (9144 mm) of grade shall meet the requirements of the Large Missile Test of ASTM E1996.
2. Glazed openings located more than 30 feet (9144 mm) above grade shall meet the provisions of the small missile test of ASTM E1996.

Exceptions:

1. Wood structural panels with a minimum thickness of $^{7}/_{16}$ inch (11.1 mm) and maximum panel span of 8 feet (2438 mm) shall be permitted for opening protection in one- and two-story buildings classified as Group R-3 or R-4 occupancy. Panels shall be precut so that they shall be attached to the framing surrounding the opening containing the product with the glazed opening. Panels shall be predrilled as required for the anchorage method and shall be secured with the attachment hardware provided. Attachments shall be designed to resist the components and cladding loads determined in accordance with the provisions of ASCE 7, with corrosion-resistant attachment hardware provided and anchors permanently iustalled on the building. Attachment in accordance with Table 1609.1.2 with corrosion-resistant attachment hardware provided and anchors permanently installed on the building is permitted for buildings with a mean roof height of 45 feet (13716 mm) or less where V_{asd} determined in accordance with Section 1609.3.1 ~~wind speeds do~~ does not exceed 140 mph (63 m/s).
2. Glazing in ~~Occupancy~~ Risk Category I buildings as defined in Section 1604.5, including greeuhouses that are occupied for growing plants on a production or research basis, without public access shall be permitted to be unprotected.
3. Glazing in ~~Occupancy~~ Risk Category II, III, or IV buildings located over 60 feet (18288 mm) above the ground and over 30 feet (9144 mm) above aggregate surface roofs located within 1500 feet (458 m) of the building shall be permitted to be unprotected.

1609.3 Basic Wind Speed. The ~~basic~~ ultimate design wind speed, V_{ult}, in mph, for the determination of the wind loads shall be determined by ~~Figure 1609~~ Figures 1609A, 1609B, aud 1609C. The ultimate design wind speed, V_{ult}, for use in the design of Risk Category II buildings and structures shall be obtained from Figure 1609A. The ultimate design wind speed, V_{ult}, for use in the design of Risk Category III and IV buildings and structures shall be obtained from Figure 1609B. The ultimate design wind speed, V_{ult}, for use in the desigu of Risk Category I buildings and structures shall be obtained from Figure 1609C. ~~Basic~~ The ultimate design wind speed, V_{ult}, for the special wind regions indicated, near mountainous terrain and near gorges shall be in accordance with local jurisdiction

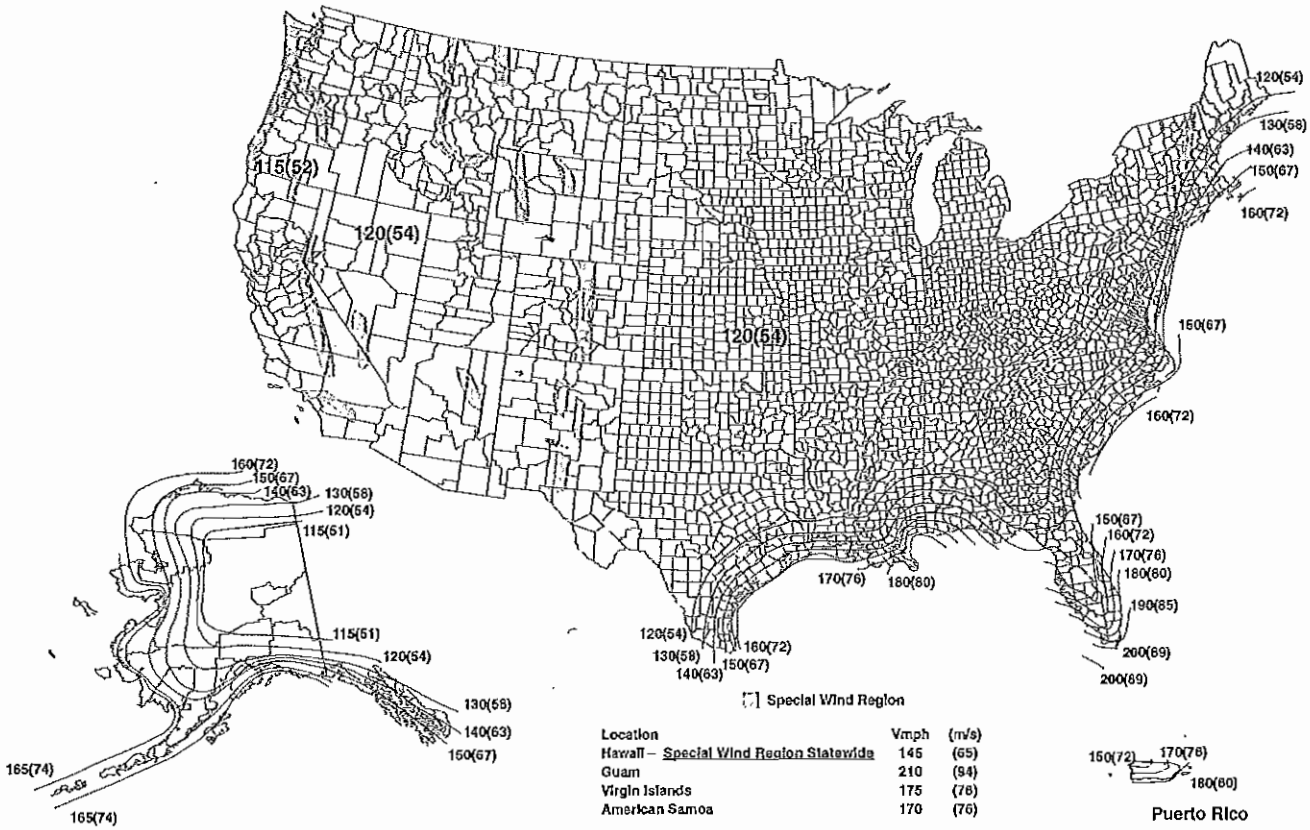
In nonhurricane-prone regions, when the ~~basic~~ ultimate design wind speed, V_{ult}, is estimated from regional climatic data, the ~~basic~~ ultimate design wind speed, V_{ult}, shall be ~~not less than the wind speed associated with an annual probability of 0.02 (50-year mean recurrence interval), and the estimate shall be adjusted for equivalence to a 3-second gust wind speed at 33 feet (10 m) above ground in Exposure Category C. The data analysis shall be performed~~ determined in accordance with Section 26.5.3 ~~6.5.4.2~~ of ASCE 7.



Notes:

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10m) above ground for Exposure C category.
2. Linear interpolation between contours is permitted.
3. Islands and coastal areas outside the last contour shall use the last wind speed contour of the coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.
5. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (Annual Exceedance Probability = 0.00143, MRI = 700 years).

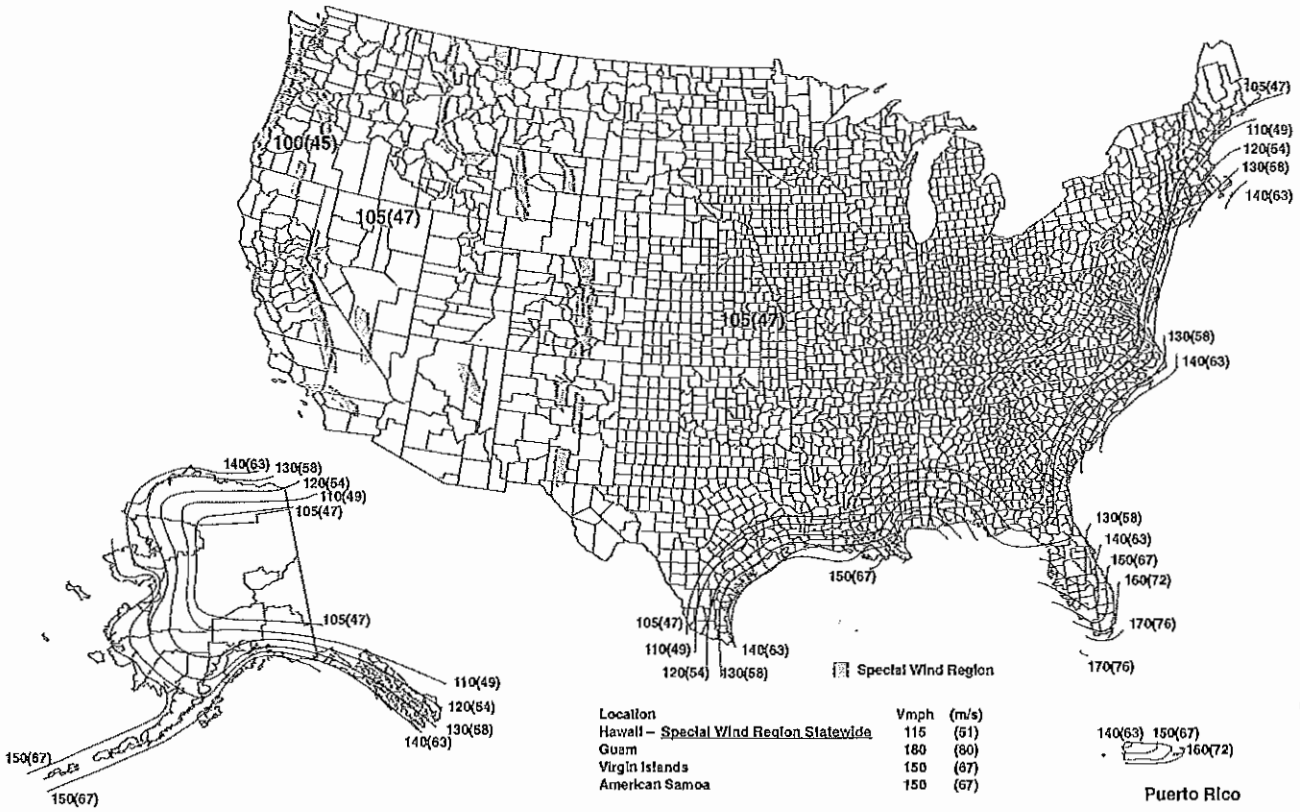
Figure 1609A Ultimate Design Wind Speeds, V_{ult}, For Risk Category II Buildings and Other Structures



Notes:

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10m) above ground for Exposure C category.
2. Linear interpolation between contours is permitted.
3. Islands and coastal areas outside the last contour shall use the last wind speed contour of the coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.
5. Wind speeds correspond to approximately a 3% probability of exceedance in 50 years (Annual Exceedance Probability = 0.000588, MRI = 1700 years).

Figure 1609B Ultimate Design Wind Speeds, V_{ult}, For Risk Categories III And IV Buildings and Other Structures



Notes:

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10m) above ground for Exposure C category.
2. Linear interpolation between contours is permitted.
3. Islands and coastal areas outside the last contour shall use the last wind speed contour of the coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.
5. Wind speeds correspond to approximately a 15% probability of exceedance in 50 years (Annual Exceedance Probability = 0.00333, MRI = 300 years).

Figure 1609C Ultimate Design Wind Speeds, V_{ult}, For Risk Category I Buildings and Other Structures

1609 continued

1609.3.1 Wind speed conversion. When required, the ~~3-second gust basic~~ ultimate design wind speeds of Figure 1609A, B, and C shall be converted to nominal design wind speeds, V_{asd}, ~~fastest-mile wind speeds, V_{fm}~~, using Table 1609.3.1 or Equation 16-33.

$$V_{fm} = \frac{V_{3s} - 10.5}{1.05} \qquad \text{(Equation 16-33)}$$

~~where:~~

~~V_{3S} = 3-second gust basic wind speed from Figure 1609.~~

$V_{asd} = V_{ult}\sqrt{0.6}$

Where:

V_{asd} = nominal design wind speed applicable to methods specified in Exceptions 1 through 5 of Section 1609.1.1

V_{ult} = nltimate design wind speeds determined from Figures 1609A, 1609B, or 1609C

~~TABLE 1609.3.1 Equivalent Basic Wind Speeds~~[a,b,c]

~~V_{3S}~~	~~85~~	~~90~~	~~100~~	~~105~~	~~110~~	~~120~~	~~125~~	~~130~~	~~140~~	~~145~~	~~150~~	~~160~~	~~170~~
~~V_{fm}~~	~~71~~	~~76~~	~~85~~	~~90~~	~~95~~	~~104~~	~~109~~	~~114~~	~~123~~	~~128~~	~~133~~	~~142~~	~~152~~

~~For SI: 1 mile per hour = 0.44 m/s.~~

~~a. Linear interpolation is permitted.~~

~~b. $V3S$ is the 3-second gust wind speed (mph).~~

~~c. Vfm is the fastest-mile wind speed (mph).~~

TABLE 1609.3.1 Wind Speed Conversions[a,b,c]

V_{ul}	100	110	120	130	140	150	160	170	180	190	200
V_{asd}	78	85	93	101	108	116	124	132	139	147	155

a. Linear interpolation is permitted

b. V_{asd} = nominal design wind speed applicable to methods specified in Exceptions 1 through 5 of Section 1609.1.1

c. V_{ult} = ultimate design wind speeds determined from Figures 1609A, 1609B, or 1609C

Because this code change affected substantial portions of Chapters 16 and 17, the entire code change text is too extensive to be included here. Refer to Code Change S84-09/10 in the *2012 IBC Code Changes Resource Collection* for the complete text and history of the code change.

CHANGE SIGNIFICANCE: The most significant aspect of the wind design change is that the wind speed maps in the 2012 IBC were updated to those adopted in ASCE 7-10. Over the past 10 years, new research has indicated that the hurricane wind speeds provided in ASCE 7-05 have been too conservative and should be adjusted downward. As more hurricane data became available, it was also recognized that substantial improvements could be made to the hurricane simulation model used to develop the wind speed maps. The new data resulted in an improved representation of the hurricane wind field, including the modeling of the sea–land transition and the hurricane boundary layer height; new models for hurricane weakening after landfall; and an improved statistical model for the Holland *B* parameter, which controls the

produced by the new model increased compared to those produced by the hurricane simulation model used to develop previous wind speed maps.

In developing the new wind speed maps, it was decided to use multiple ultimate event or strength design based maps in conjunction with a wind load factor of 1.0 for strength design. For allowable stress design (ASD), the load factor has been reduced from 1.0 to 0.6, thus the load combinations in Section 1605 had to be modified accordingly. Several important factors related to more accurate wind load determination were considered that led to the decision to move to strength based ultimate event wind loads:

1. An ultimate event or strength design wind speed map makes the overall approach consistent with the well-established strength-based seismic design procedure in that both wind and seismic load effects are mapped as ultimate events and use a load factor of 1.0 for the strength design load combinations.
2. Utilizing different maps for the different risk categories eliminates previous issues associated with using importance factors that vary according to the risk (occupancy) category of the building. The different importance factors in ASCE 7-05 for hurricane prone versus non-hurricane prone regions for Risk (Occupancy) Category I structures prompted many questions by code users. This is no longer an issne in ASCE 7-10 because Risk Category I, Risk Category II, and Risk Category III and IV have separate wind speed maps, and the importance factor no longer appears in the velocity pressnre equation. Note that the importance factor for wind in ASCE 7 Table 1.5-2 is now 1.00 for all risk categories.
3. The use of multiple maps based on risk category eliminates some confusion associated with the recurrence interval associated with the previous wind speed map in ASCE 7-05 becanse it was not a uniform 50-year return period map. This results in a situation where the level of safety achieved by the overall design was not consistent along the hurricane coast. The wind maps in ASCE/SEI 7-10 have a mean recurrence interval (MRI) of 300 years for Risk Category I, 700 years for Risk Category II, and 1700 years for Risk Categories III and IV.

As a result of the new strength-based wind speed, new terminology was introdnced into the 2012 IBC. The former term "basic wind speed" has been changed to "ultimate design wind speed" and is designated V_{ult}. The wind speed that is equivalent to the former basic wind speed is now called the nominal design wind speed, V_{asd}, and the conversion between the two is given by Equation 16-33 as,

$$V_{asd} = V_{ult}\sqrt{0.6}$$

The conversion from V_{asd} to V_{ult} is a result of the wind load being proportional to the square of the velocity pressure and the ASD wind load being 0.6 tines the strength level ultimate wind load. Thus,

$$W \cong V^2$$

1609 continued

It shonld also be noted that the term "basic wind speed" in ASCE 7-10 corresponds to the "ultimate design wind speed" in the 2012 IBC.

Because many different code provisions in the code are based upon wind speed, it was necessary to modify the wind speed conversion section so that the many provisious triggered by wind speed were not changed. The terms "ultimate design wind speed" and "nominal design wind speed" were incorporated in numerous locations to help the code user distinguish between them. In cases where wind speed is used to trigger a requirement, the ultimate wind speed, V_{ult}, must be converted to an equivalent wind speed that corresponds to the former basic wind speed. Thus, a new table in the 2012 IBC converts V_{ult} to V_{ASD} so that the mapped wind speed thresholds in various parts of the code can still be used:

V_{ult}	100	110	120	130	140	150	160	170	180	190	200
V_{asd}	78	85	93	101	108	116	124	132	139	147	155

For example, in a case where the 2009 IBC imposed requirements where the basic wind speed exceeds 100 mph, the 2012 IBC imposes the requirements where V_{asd} exceeds 100 mph. A nominal design speed, V_{asd}, equal to 100 mph corresponds to an ultimate design wiud speed, V_{ult}, equal to 129 mph. The following table (which is not in the IBC) may be more useful to the code user because it gives V_{ult} in terms of V_{asd} in increments of 10 mph:

V_{asd}	85	90	100	110	120	130	140	150
V_{ult}	110	115	126	139	152	164	177	190

For a comparison of ASCE 7-93 fastest mile wind speeds, ASCE 7-05 3-second gust ASD wind speeds, and ASCE 7-10 3-second gust wind speeds, refer to Table C26.5-6 of the ASCE 7-10 commentary. Note that the conversion in ASCE 7-10 is given by $V_{ult} = V_{asd}\sqrt{1.6}$, which produces slightly different values than IBC Equation 16-33.

Beyond the adoption of the new streugth desigu wind speed maps, ASCE/SEI 7-10 also includes a new simplified method for use in the determination of wind loads for buildings up to 160 feet iu height. In addition, the wind load calculation provisions that were contaiued in Chapter 6 of ASCE/SEI 7-05 have been reorganized into six separate chapters (26 through 31) for improved clarity and ease of use. This is similar to the reorganization in ASCE 7-05 where the seismic design provisions were divided into several chapters to facilitate use. This reorganization into multiple chapters required several coordination revisions to the code text.

A few other changes to the wind design provisions in Section 1609 are worth noting:

- To use auy of the five standards referenced in the exception in Section 1609.1.1, the ultimate design wind speed must be determined based ou the risk category of the building then converted to the nominal design wind speed.
- Wiud tunnel test limitations in 2009 IBC Section 2309.1.2 were deleted from the IBC because they are incorporated into Chapter 31

- The hurricane-prone region is redefined in terms of the ultimate design wind speed as shown on the Risk Category II wind speed map.
- The windborne debris region is now defined in terms of the ultimate design wind speed and determined from the appropriate risk category wind speed map. For example, for Risk Category II and III buildings and structures, except health care facilities, the windborne debris region is based on Figure 1609A. For Risk Category IV buildings and structures and Risk Category III health care facilities, the windborne debris region is based on Figure 1609B.
- The ultimate design wind speed, V_{ult}, for the special wind regions indicated, near mountainous terrain and near gorges is to be determined in accordance with local jurisdiction requirements and in accordance with Section 26.5.1 of ASCE 7. In nonhurricane-prone regions, when the ultimate design wind speed is estimated from regional climatic data, V_{ult}, is to be determined in accordance with Section 26.5.3 of ASCE 7.

It should be noted that the alternate all-heights wind design procedure is maintained in the 2012 IBC but was updated to conform to the new ultimate wind design procednre in ASCE 7-10.

2406.1, 2406.4

Safety Glazing—Hazardous Locations

CHANGE TYPE: Modification

CHANGE SUMMARY: The hazardous locations identified in the safety glazing provisions have been reorganized and clarified in order to provide better consistency between the IBC and IRC.

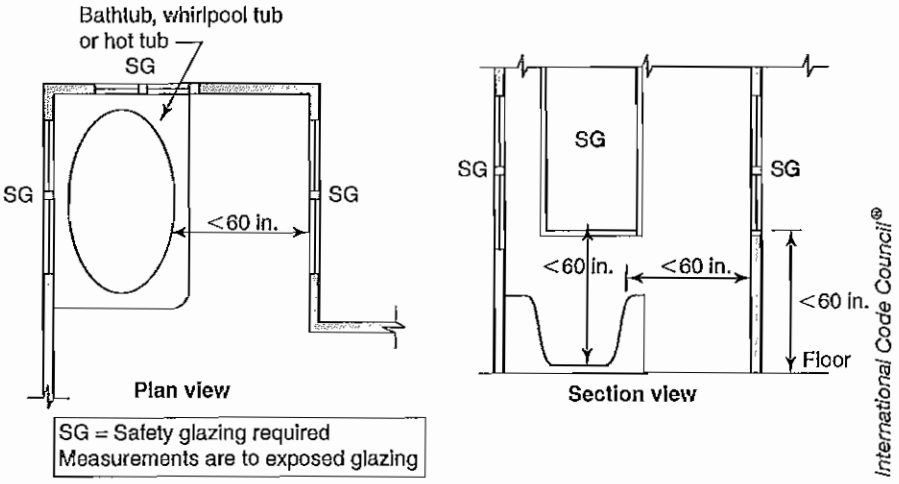
2012 CODE: 2406.1 Human Impact Loads. Individual glazed areas, including glass mirrors, in hazardous locations as defined in Section 2406.4 shall comply with Sections 2406.1.1 through 2406.1.4.

Exception: Mirrors and other glass panels mouuted or hung on a surface that provides a continuous backing support.

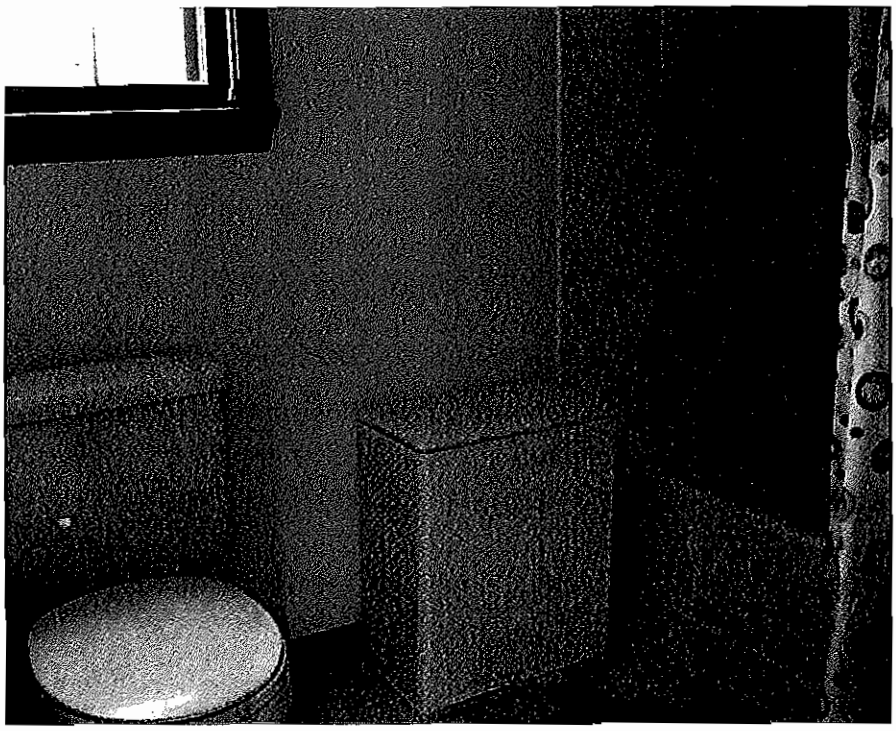
2406.4 Hazardous Locations. The ~~following~~ locations specified in Sections 2306.4.1 through 2406.4.7 shall be considered specific hazardous locations requiring safety glazing materials.~~:~~

1. ~~Glazing in swinging doors except jalousies (see Section 2406.4.1).~~
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 unframed swinging doors.~~
5. ~~Glazing in doors and enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers. Glazing in any portion of a building wall enclosing these compartments where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) above a standing surface.~~

2406.4.1 Glazing in Doors. Glazing iu all fixed and operable panels of swinging, sliding, aud bifold doors shall be considered a hazardous location.



Hazardous locations near wet surfaces



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Glazing near wet surfaces is considered as being in a hazardous location.

Exceptions:

1. Glazed openings of a size through which a 3-inch (76-mm)-diameter sphere is unable to pass.
2. Decorative glazing.
3. Glazing materials used as curved glazed panels in revolving doors.
4. Commercial refrigerated cabinet glazed doors.

6. **2406.4.2 Glazing Adjacent to Doors.** Glazing in an individual fixed or operable panel adjacent to a door where the nearest ~~exposed~~ vertical edge of the glazing is within a 24-inch (610-mm) arc of either vertical edge of the door in a closed position and where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) above the walking surface shall be considered a hazardous location.

Exceptions:

1. Decorative glazing.
2. ~~Panels where~~ Where there is an intervening wall or other permanent barrier between the door and glazing.
3. Where access through the door is to a closet or storage area 3 feet (914 mm) or less in depth. Glazing in this application shall comply with Section ~~2406.4, Item 7~~ 2406.4.3.

2406.1, 2406.4 continued

~~swings when opened;~~ on the latch side of and perpendicular to the plane of the door in a closed position in one- and two-family dwellings or within dwelling units in Group R-2.

~~7.~~ **2406.4.3 Glazing in Windows.** Glazing in an individual fixed or operable pauel~~, other than in those locations described in preceding Items 5 and 6, which~~ that meets all of the following conditions shall be considered a hazardous location:

~~7.~~1. ~~Exposed~~ The exposed area of an individual pane is greater than 9 square feet (0.84 m^2).

~~7.~~2. ~~Exposed~~ The bottom edge of the glazing is less than 18 inches (457 mm) above the floor.

~~7.~~3. ~~Exposed~~ The top edge of the glazing is greater than 36 inches (914 mm) above the floor.

~~7.~~4. One or more walking surface(s) are within 36 inches (914 mm), measured horizontally ~~of the plane~~ and in a straight line, of the glazing.

Exceptions: ~~Safety glazing for Item 7 is not required for the following installations:~~

~~1. A protective bar 11/2 inches (38 mm) or more in height, capable of withstanding a horizontal load of 50 pounds plf (730 N/m) without contacting the glass, is installed on the accessible sides of the glazing 34 inches to 38 inches (864 mm to 965 mm) above the floor.~~

1. Decorative glazing.

2. When a horizontal rail is installed on the accessible side[s] of the glazing 34 to 38 inches above the walking surface. The rail shall be capable of withstanding a horizontal load of 50 pounds per linear foot (730 N/m) without contacting the glass and be a minimum of 1½ inches (38 mm) in cross-sectional height.

~~2~~3. The outboard Outboard panes in insulating glass units or multiple glazing where the bottom exposed edge of the glass is 25 feet (7620 mm) or more above any grade, roof, walking surface, or other horizontal or sloped (within 45 degrees of horizontal) (0.78 rad) surface adjacent to the glass exterior.

~~8.~~ **2406.4.4 Glazing in Guards and Railings.** Glazing in guards and railings, including structural baluster panels and nonstructural in-fill panels, regardless of area or height above a walking surface, shall be considered a hazardous location.

~~9. Glazing in walls and fences enclosing indoor and outdoor swimming pools, hot tubs and spas where all of the following conditions are present:~~

~~9.1. The bottom edge of the glazing on the pool or spa side is less than 60 inches (1524 mm) above a walking surface on the pool or spa side of the glazing; and~~

~~9.2. The glazing is within 60 inches (1524 mm) horizontally of the water's edge of a swimming pool or spa.~~

2406.4.5 Glazing and Wet Surfaces. Glazing in walls, enclosures, or fences containing or facing hot tubs, spas, whirlpools, saunas, steam rooms, bathtubs, showers, and indoor or outdoor swimming pools, where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) measured vertically above any standing or walking surface, shall be considered a hazardous location. This shall apply to single glazing and all panes in multiple glazing.

Exception: Glazing that is more than 60 inches (1524 mm), measured horizontally and in a straight line, from the water's edge of a bathtub, hot tub, spa, whirlpool, or swimming pool.

~~10.~~ **2406.4.6 Glazing Adjacent Stairs and Ramps.** Glazing ~~adjacent to~~ where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) above the plane of the adjacent walking surface of stairways, landings between flights of stairs, and ramps shall be considered a hazardous location ~~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.~~

Exceptions:

1. The side of a stairway, landing, or ramp that has a guard complying with the provisions of Sections 1013 and 1607.8, and the plane of the glass is greater than 18 inches (457 mm) from the railing.
2. Glazing 36 inches (914 mm) or more measured horizontally from the walking surface.

~~11.~~ **2406.4.7 Glazing Adjacent The Bottom Stair Landing.** ~~Glazing adjacent to stairways within 60 inches (1524 mm) horizontally of the bottom tread of a stairway in any direction when the exposed surface of the glass is less than 60 inches (1524 mm) above the nose of the tread.~~ Glazing adjacent the landing at the bottom of a stairway where the glazing is less than 36 inches (914 mm) above the landing and within 60 inches (1524 mm) horizontally of the bottom tread shall be considered a hazardous location.

Exception: ~~Safety glazing for Item 10 or 11 is not required for the following installations where:~~

1. ~~The side of a stairway, landing or ramp which has~~ Glazing that is protected by a guard ~~or handrail, including balusters or in-fill panels,~~ complying with ~~the provisions of~~ Sections 1013 and 1607.8; and ~~2. The~~ the plane of the glass is greater than 18 inches (457 mm) from the ~~railing~~ guard.

~~**2406.4.1 Exceptions.** The following products, materials and uses shall not be considered specific hazardous locations:~~

~~1. Openings in doors through which a 3-inch (76 mm) sphere is~~

2406.1, 2406.4 continued

~~3. Glazing materials used as curved glazed panels in revolving doors.~~

~~4. Commercial refrigerated cabinet glazed doors.~~

~~5. Glass-block panels complying with Section 2101.2.5.~~

~~6. Louvered windows and jalousies complying with the requirements of Section 2403.5.~~

~~7. Mirrors and other glass panels mounted or hung on a surface that provides a continuous backing support.~~

CHANGE SIGNIFICANCE: An effective reorganization of the hazardous locations for safety glazing purposes has been accomplished, resulting in the elimination of conflicts, creation of consistency, and ease of use. By taking the 11 hazardous locations and seven exceptions that previously existed in Section 2604.4 and reformattiug them into seven individual provisions with the appropriate exceptions located directly within the applicable provision, the understanding of the intent should be much easier. Code users should be aware that although this was predominately a reorgauization effort, some technical changes do result from the relocation or combination of provisions. As au example, see the discussion related to Section 2406.4.5.

The point-by-point explanation that follows should assist in understanding the reorganization of the various requirements.

The exception to Section 2406.1 was relocated from Item 7 in Section 2406.4.1 with no change iu application because these items were previously exempted.

The "glazing in doors" requirements of new Section 2406.4.1 now include Items 1 through 4 from previous Section 2406.4. Iu a technical change, jalousie wiudows were previously exempted from the safety glazing requirement. Because jalousies are no longer listed among the exceptions, they are now required to be safety glazing unless exempted by the limited size or decorative glazing provisions of Exception 1 or 2. The four exceptions that are listed in this section were previously listed as the first four exceptions iu Section 2406.4.1.

Section 2406.4.2 dealing with "glazing adjacent to doors" and several of the exceptions were previously found iu Item 6 of Section 2406.4. New Exception 1 was previously Exception 2 iu Section 2406.4.1. Exception 4 was revised iu order to clarify the provisions and to coordiuate with similar text in the IRC.

The glazed window requirements of Section 2406.4.3 now combine the provisions of previous Section 2406.4, Item 7, and Exception 2 from Section 2406.4.1. The provisions regarding protectiug the window from impact by the use of a horizontal rail have been revised in order to coordinate with the language of the IRC.

Section 2406.4.5 addressing glazing adjacent to wet surfaces is essentially a combination of the previous provisions related to glazing adjacent to hot tubs, bathtubs, and showers (Item 5 in Section 2406.4) as well as pools aud spas (Item 9 in Section 2406.4). A single section relatiug to hazardous glazing adjacent to water will include the criteria that previously applied to walls aud fences around a pool as the means to determine if the glazing is in a hazardous location. This revision will affect the application of the requirements to the bathtubs, showers, aud other items that were

hot tub, spa, or whirlpool. To illnstrate the most significant impact of the change, consider a bathroom with a shower that is enclosed on three sides by solid walls and on the fourth side by a set of glass doors. Previously, these four sides created the "enclosure" for the shower and the only location regulated for safety glazing purposes was the glass doors. Under the revised provisions, if a person would step out of the enclosed shower and a window in the wall of the bathroom is located within the established 60-inch height and 60-inch horizontal distance, that window is regulated. Previously, because the bathroom window was considered outside of the shower "enclosure," it would have been regulated by the general window requirements (Section 2406.4, Item 7) and not by the shower enclosure provisions of Section 2406.4, Item 5.

The provisions of Sections 2406.4.6 and 2406.4.7 will replace what had previously been Section 2406.4, Items 10 and 11, addressing two different locations related to glazing near stairways. The primary distinction is that Section 2406.4.7 will only regulate the glazing that is adjacent to the bottom landing on a stair. Therefore, when a stairway terminates at a floor level, Section 2406.4.7 would be applicable within 60 inches of the bottom tread, but if the landing were located between two adjacent flights of stairs, then Section 2406.4.6 would be the applicable provision. Code users should note that the provisions dealing with glazing at the bottom of the stair will apply when the bottom edge of the glazing is less than 36 inches above the landing. Previously, any glazing that was less than 60 inches above the nosing of the last tread was regulated. The reduction down to the 36-inch height was made based on an exception within the IRC exempting safety glaziug where a solid wall or pauel that places the glazing at or above the handrail or guard height is capable of withstanding the guard loading requirements.

6109.15.1 Automated Cylinder Exchange Stations. Cylinder exchange stations that include an automated vending system for exchanging cylinders shall comply with the following additional requirements:

1. The vending system shall only permit access to a single cylinder per individual transaction.
2. Cabinets storing cylinders shall be designed such that cylinders can only be placed inside when they are oriented in the upright position.
3. Devices operating door releases for access to stored cylinders shall be permitted to be pneumatic, mechanical or electrically powered.
4. Electrical equipment inside of or within 5 feet of a cabinet storing cylinders, including but not limited to electronics associated with vending operations, shall comply with the requirements for Class I, Division 2 equipment in accordance with NFPA 70.
5. A manual override control shall be permitted for use by anthorized personnel. On newly installed cylinder exchange stations, the vending system shall not be capable of returning to automatic operation after a manual override until the system has been inspected and reset by anthorized personnel.
6. Inspections shall be conducted by authorized personnel to verify that all cylinders are secured, access doors are closed and the station has no visible damage or obvious defects, which necessitate placing the station out of service. The frequency of inspections shall be as specified by the fire code official.

CHANGE SIGNIFICANCE: Cylinder exchange cabinets for 20-pound LP-gas cylinders have been available to consumers for over 15 years and have an extremely respectable safety record. Cabinets for exchange of industrial cylinders, such as those found on forklift trucks, are also in use. Though a limited number of incidents resulting from impact from vehicles has been reported, none of these events has resulted in loss of life or severe injuries. It is estimated that several million sales transactions occur annually at cylinder exchange stations.

Requirements for locating LP-gas cylinder exchange stations are found in Table 6109.12 and were revised in the 2006 IFC. NFPA 58 has since been revised to correlate with the IFC table.

One of the bigger advancements in cylinder exchange programs is the use of automation at the point of sale (POS). These improvements have allowed exchange stations to become self-service, meaning that retailers can allow their employees to focus on other interests in the store rather than managing the exchange of LP-gas cylinders. Consumers can now use an electronic banking card at automated exchange stations, where they receive a properly filled and code-compliant cylinder of LP-gas while the supplier receives an empty cylinder in return. Because the automated cabinet POS is monitored, the consumer is assured that product is almost always available.

6109.15 continues

6109.15 continued

New requirements were added in Section 6109.15 to address all LP-gas cylinder exchange stations. This new section requires all cylinder exchange cabinets, regardless of whether they are manual or automatic, to be designed so that the cabinet naturally ventilates the stored cylinders and is equipped with a means of securing cylinders from tampering. An approved sign is required to inform consumers that bringing cylinders inside of a building is prohibited, based on the requirement in Section 6109.9; as well as emergency contact information in the event of a leaking cylinder or other emergency involving the exchange station.

Item 2 in Section 6109.15 limits access to cylinders to authorized personnel or to users of automated cylinder exchange stations. At an automated cylinder exchange station, Item 5 of Section 6109.15.1 requires that when a manual override occurs, it must be performed by an authorized person before returning the station to automatic operation. Code officials should apply the requirements in Section 4.4 of NFPA 58 for qualification of personnel who are involved in the operation of cylinder exchange stations. NFPA 58 requires that they be trained in proper cylinder handling procedures. Training can be provided by the LP-gas supplier, and many suppliers offer programs prepared by the Propane Education and Research Council, which offers a Certified Employee Training Program to its members. NFPA 58 Section 4.4 also requires refresher training of authorized personnel at least every 3 years, and all training must be documented.

Section 6109.15.1 contains new provisions for automated LP-gas cylinder exchange stations. These requirements ensure that consumers properly remove filled cylinders and return empty cylinders so that they are positioned with the pressure relief valve in direct communication with the vapor space. The vending system must be designed to limit the consumer to one cylinder per transaction. Components inside the exchange cabinet can be powered by pneumatic, mechanical, or electrical energy.

When electrical equipment is used inside or within 5 feet of an automated exchange station, it must be listed for use in Class I, Group D, Division 2 hazardous locations in accordance with the NEC®. Normally flammable gases in storage do not require hazardous location electrical equipment, but in the case of automated LP-gas cylinder exchange stations, the possibility exists for a cylinder valve to not be completely closed on a cylinder that has been returned by a consumer. Item 4 in Section 6109.15.1 specifies hazardous location electrical equipment and the boundary of the hazardous location to mitigate the risk of igniting fugitive gas. Some cabinet manufacturers provide a remote POS kiosk that is located more than 5 feet from the exchange station to accommodate this requirement with ordinary electrical equipment.

Automated cylinder exchange stations are required to be inspected by authorized personnel at a frequency specified by the fire code official. Factors to consider in establishing a required inspection frequency include the servicing/refill interval for the cabinet. Certainly an inspection each time the exchange station is restocked with filled cylinders is one possible interval that could be deemed compliant with Section 6109.15.1, Item 6.

306.5

Equipment and Appliances on Roofs or Elevated Structures

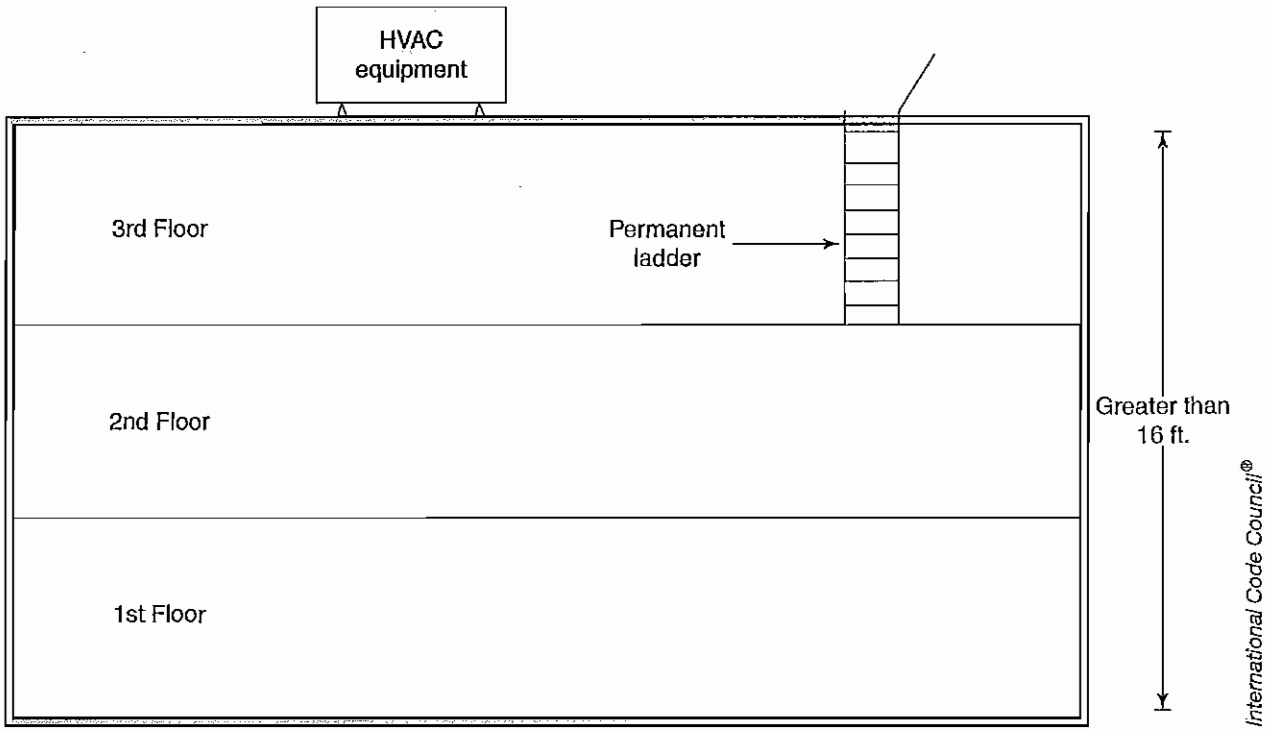
CHANGE TYPE: Modification

CHANGE SUMMARY: It has been clarified that permanent access is required to equipment and appliances on a roof or elevated structure higher than 16 feet above grade, and required clearances are now provided to assure access to ladders required for access to roofs or elevated structures.

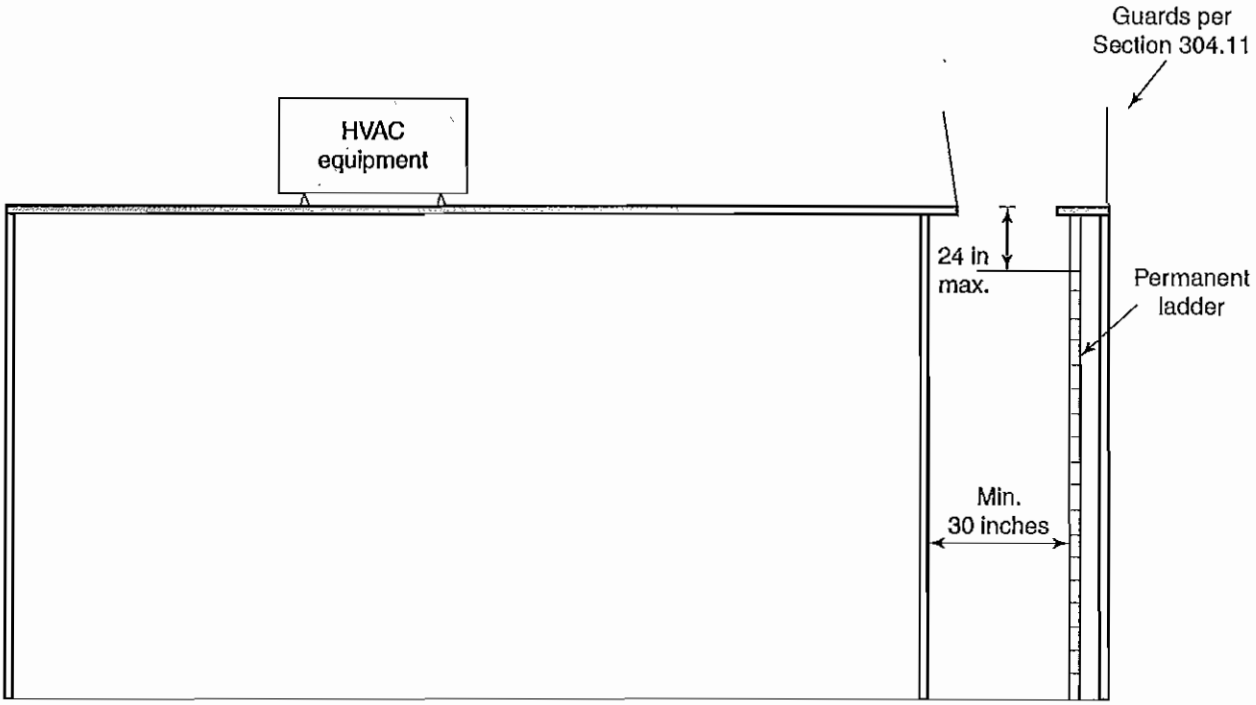
2012 CODE: 306.5 Equipment and Appliances on Roofs or Elevated Structures. Where equipment requiring access ~~and~~ or appliances are ~~installed on roofs or elevated structures at a height exceeding 16 feet (4877 mm), such access shall be provided by a permanent approved means of access, the extent of which shall be from grade or floor level to the equipment and appliances' level service space~~ located on an elevated structure or the roof of a building such that personnel will have to climb higher than 16 feet (4877 mm) above grade to access such equipment or appliances, an interior or exterior means of access shall be provided. Such access shall not require climbing over obstructions greater than 30 inches (762 mm) in height or walking on roofs having a slope greater than 4 units vertical in 12 units horizontal (33-percent slope). Such access shall not require the use of portable ladders. Where access involves climbing over parapet walls, the height shall be measured to the top of the parapet wall.

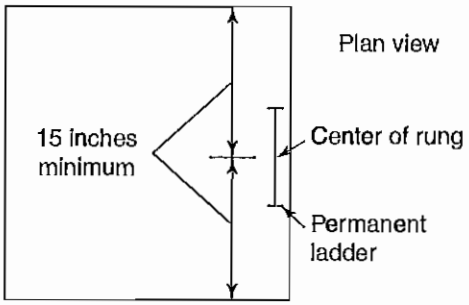
Permanent ladders installed to provide the required access shall comply with the following minimum design criteria:

1. The side railing shall extend above the parapet or roof edge not less than 30 inches (762 mm).
2. Ladders shall have rung spacing not to exceed 14 inches (356 mm) on center. The upper-most rung shall be a maximum of



Roof access





Minimum 30 inch x 30 inch bottom landing

International Code Council®

Access ladder

24 inches (610 mm) below the upper edge of the roof hatch, roof or parapet, as applicable.

3. Ladders shall have a toe spacing not less than 6 inches (152 mm) deep.
4. There shall be a minimum of 18 inches (457 mm) between rails.
5. Rnngs shall have a minimum 0.75-inch (19 mm) diameter and be capable of withstanding a 300-pound (136.1kg) load.
6. Ladders over 30 feet (9144 mm) in height shall be provided with offset sections and landings capable of withstanding 100 pounds per square foot (488.2 kg/m2). Landing dimensions shall be not less than 18 inches (457 mm) and not less than the width of the ladder served. A guard rail shall be provided on all open sides of the landing.
7. Climbing clearance. The distance from the centerline of the rungs to the nearest permanent object on the climbing side of the

306.5 continues

306.5 continued

ladder shall be a minimum of 30 inches (762 mm) measured perpendicular to the rungs. This distance shall be maintained from the point of ladder access to the bottom of the roof hatch. A minimum clear width of 15-inches (381 mm) shall be provided on both sides of the ladder measured from the midpoint of and parallel with the rungs except where cages or wells are installed.

8. Landing required. The ladder shall be provided with a clear and nnobstructed bottom landing area having a minimum dimension of 30 inches (762 mm) by 30 inches (762 mm) centered in front of the ladder.

~~7~~9. Ladders shall be protected against corrosion by approved means.

10. Access to ladders shall be provided at all times.

Catwalks installed to provide the required access shall be not less than 24 inches (610 mm) wide and shall have railings as required for service platforms.

Exception: This section shall not apply to Group R-3 occupancies.

CHANGE SIGNIFICANCE: Where a piece of equipment or an appliance that requires access is located on a roof or elevated structure more than 16 feet above grade level, it has been clarified that a means of access must be provided. If an appliance is located on the roof of a multistory building and the roof access is through a roof hatch opening on the top story of the building, a permanent ladder is required from the floor level to the top roof hatch. The same requirements wonld apply if a piece of equipment or an appliance were located on an elevated platform on the roof of a building. A permanent ladder would be required to the appliance or equipment located on the platform. The modifications to the permanent ladder criteria will eliminate several hazards that have commonly occurred with roof or elevated-structure access ladders. Previous code editions did not specify how far away a ladder could terminate from a roof access opening or a minimum required distance from the front or sides of a ladder to an obstruction. A minimum landing area is also now required at the bottom of a ladder, requiring ladders to be accessible at all times.

506.3.11.2

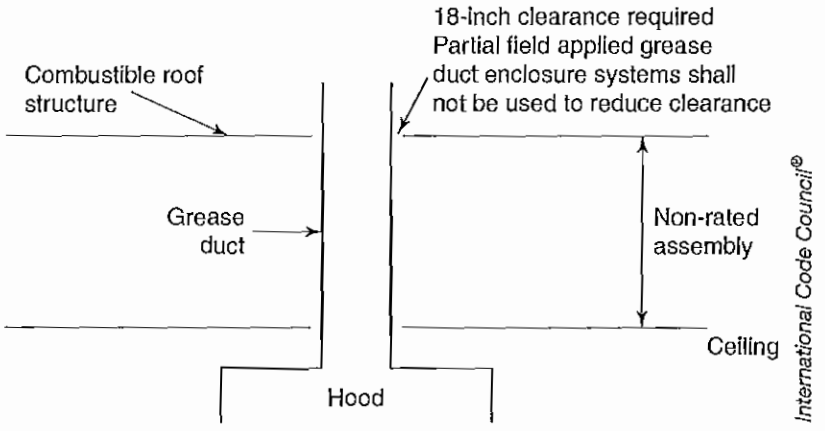
Field-Applied Grease Duct Enclosures

CHANGE TYPE: Clarification

CHANGE SUMMARY: Field-applied grease duct enclosure systems are now specifically prohibited from being used to reduce clearance to combustibles.

2012 CODE: 506.3.11.2 Field-Applied Grease Duct Enclosure. Commercial kitchen grease ducts constructed in accordance with Section 506.3.1 shall be enclosed by field-applied grease duct enclosure that is a listed and labeled material, system, product, or method of construction specifically evaluated for such purpose in accordance with ASTM E2336. The surface of the duct shall be continuously covered on all sides from the point at which the duct originates to the outlet terminal. Duct penetrations shall be protected with a through-penetration fire-stop system classified in accordance with ASTM E814 or UL 1497 and having a "F" and "T" rating equal to the fire-resistance rating of the assembly being penetrated. Such systems shall be installed in accordance with the listing and the manufacturer's installation iustructions. Partial application of a field-applied grease duct enclosure system shall not be installed for the sole purpose of reduciug clearance to combustibles at isolated sections of grease duct. Exposed duct-wrap systems shall be protected where subject to physical damage.

CHANGE SIGNIFICANCE: The basis of this code change comes from the misuse of a listed product. Field-applied grease duct enclosure systems serving Type I hoods have not been tested as partial systems for the purpose of reducing the clearance of a grease duct to combustible material. The misapplication of this duct enclosure system usually occurs where a grease duct does not require an enclosure per IMC Section 506.3.11.4 and the grease duct penetrates a roof assembly that is constructed of combustible material or there is combustible material on the decking. Iu order to reduce the clearance between the grease duct and the combustible roof assembly or combustible material on the decking, the field-applied grease duct enclosure system is often installed arouud the grease duct at the roof penetration. However, this method of clearance reduction is unacceptable, as the duct enclosure system was never iutended to be used this way, nor was it tested for this type of use.



Grease duct clearance

507.2.1

Type I Hoods

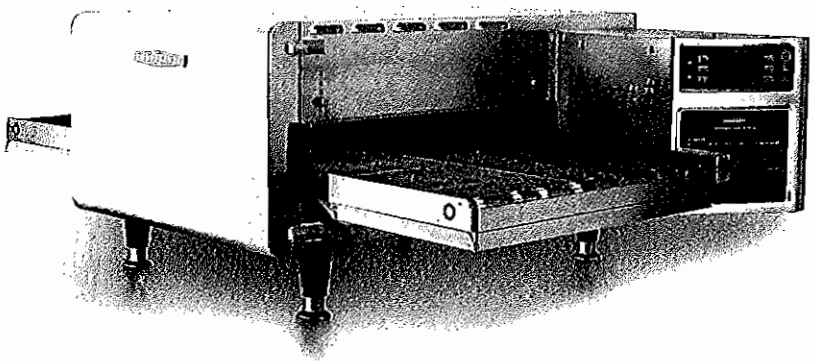
CHANGE TYPE: Modification

CHANGE SUMMARY: Type I hoods no longer are required to be installed where complying electric cooking appliances are being used.

2012 CODE: 507.2.1 Type I Hoods. Type I hoods shall be installed where cooking appliances produce grease or smoke as a result of the cooking process. Type I hoods shall be installed over medium-duty, heavy-duty and extra-heavy-duty cooking appliances. Type I hoods shall be installed over light-duty cooking appliances that produce grease or smoke.

> **Exception:** A Type I hood shall not be required for an electric cooking appliance where an approved testing agency provides documentation that the appliance effluent contains 5 mg/m^3 or less of grease when tested at an exhaust flow rate of 500 cfm (0.236 m^3/s) in accordance with Section 17 of UL 710B.

CHANGE SIGNIFICANCE: Where the cooking process does not produce quantities of grease exceeding the prescribed threshold, a Type I hood is no longer required for electric cooking appliances. The IMC provisions are now current with those of NFPA 96, *Standard for Ventilation Control, and Fire Protection Cooking Operations,* and UL 710 B, *Recirculating Systems,* that allow for the elimination of a Type I hood where grease emissions are minimal or nonexistent.



Electric oven where a hood is not required *(Courtesy of TurboChef Global)*

507.2.2

Type II Hoods

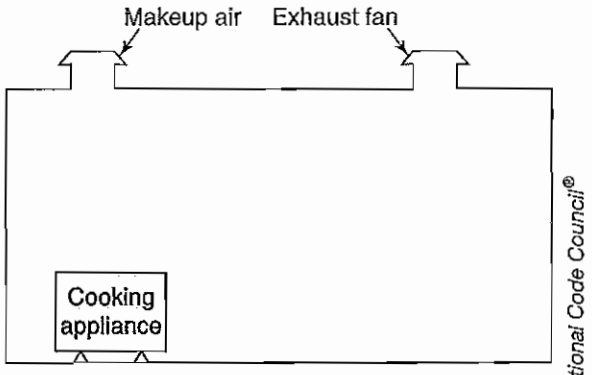
CHANGE TYPE: Modification

CHANGE SUMMARY: A Type II hood is now required to be installed above all appliances that produce products of combustion but do not produce grease or smoke. An exact exhaust rate is specified for areas where a cooking appliance is being used but a Type II hood is not required.

2012 CODE: 507.2.2 Type II Hoods. Type II hoods shall be installed above dishwashers and appliances that produce heat or moisture and do not produce grease or smoke as a result of the cooking process, except where the heat or moisture loads from such appliances are incorporated into the HVAC system design or into the design of a separate removal system. Type II hoods shall be installed above all light duty appliances that produce products of combustion and do not produce grease or smoke as a result of the cooking process. Spaces containing cooking appliances that do not require Type II hoods shall be ~~ventilated~~ provided with exhaust at a rate of 0.70 cfm per square foot (0.00033 m^3/s). ~~in accordance with Section 403.3.~~ For the purpose of determining the floor area required to be ~~ventilated~~ exhausted, each individual appliance that is not required to be installed under a Type II hood shall be considered as occupying not less than 100 square feet. Such additional square footage shall be provided with exhaust at a rate of 0.70 cfm per square foot.

CHANGE SIGNIFICANCE: Previously, a space or area where a cooking appliance was allowed to operate without a Type II hood was required to be ventilated in accordance with Section 403.3 in the IMC. Table 403.3 in the IMC does not establish any values for outside air in a kitchen, as it only specifies an exhaust rate. For clarity purposes, the exhaust rate of 0.70 cfm per square foot taken from Table 403.3 refers to a space where a cooking appliance is being used without a Type II hood. A Type II hood is now permitted to be used with appliances that are rated for other than light duty and do not produce grease, smoke, or combustion products.

The addition of the text "as a result of the cooking process" is intended to clarify that the smoke being referenced is that smoke produced as part of the normal cooking process and not a result of the food being burned. As an example, toast that is burned in a toaster and produces smoke would not establish the need for a Type II hood.



Room = 2000 sq.ft.
Cooking appliance = 100 sq.ft.
2100 x 0.70 = 1470 CFM of exhaust required

Cooking appliance that does not require a Type II hood

805.3

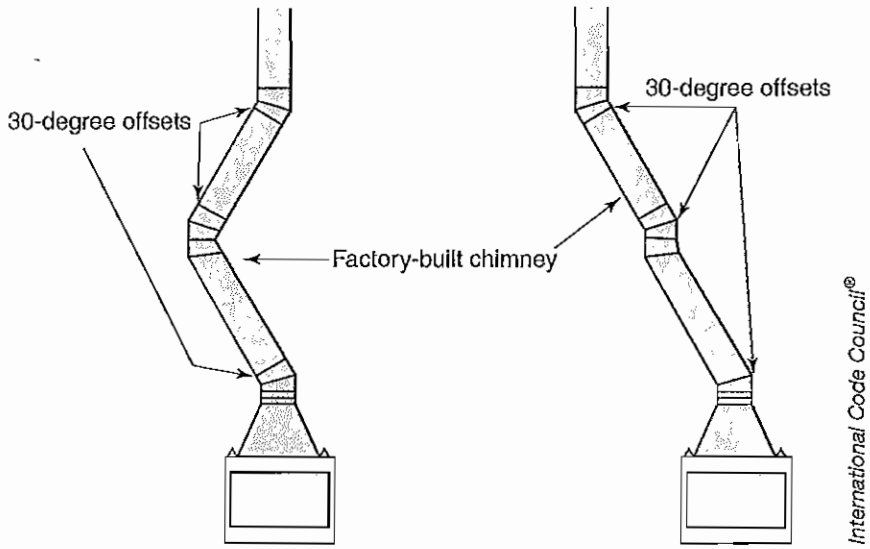
Factory-Built Chimney Offsets

CHANGE TYPE: Addition

CHANGE SUMMARY: The maximum offset in a factory-built chimney is now specified and the number of offsets has been limited.

2012 CODE: **805.3 Factory Built Chimney Offsets.** Where a factory-built chimney assembly incorporates offsets, no part of the chimney shall be at an angle of more than 30 degrees from vertical at any point in the assembly and the chimney assembly shall not include more than 4 elbows.

CHANGE SIGNIFICANCE: UL 103 addressing factory-built chimneys is the basis for the limitations specified in the new Section 805.3. There has always been confusion about offsets in factory-built chimneys, and, because of the lack of specific code provisions, reference was commonly made to the offset requirements for Type B vents nsed with gas-fired appliances. The new requirements now specify the maximum permitted offset in a factory-built chimney, as well as the maximum number of offsets allowed.



Factory-built chimney offset

610

Commercial Kitchen Cooking Oil Storage

CHANGE TYPE: New

CHANGE SUMMARY: Cooking oil storage tanks in commercial kitchens must comply with new Chapter 6 requirements for these installations and Chapter 57.

2012 CODE:

SECTION 610
COMMERCIAL KITCHEN COOKING OIL STORAGE

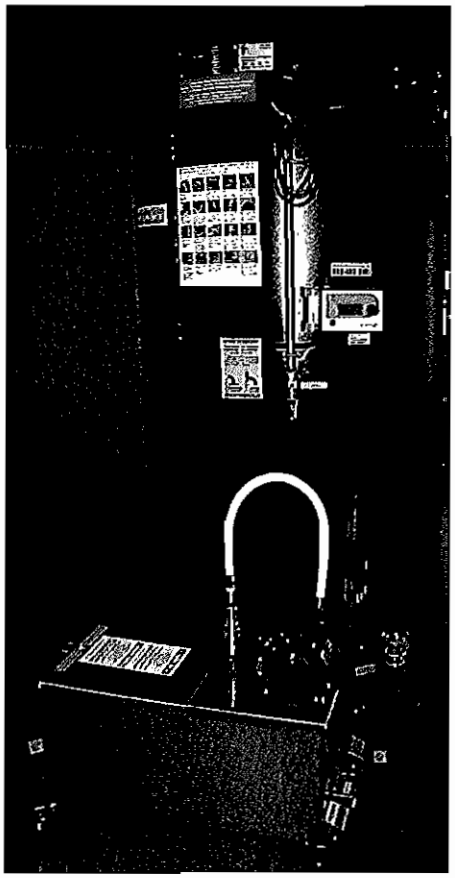
610.1 General. Storage of cooking oil (grease) in commercial cooking operations shall comply with Chapter 57. Systems used to store cooking oils in larger than 60 gallon (227 L) aboveground tanks shall also comply with Sections 610.2 through 610.5. For purposes of this section, cooking oil shall be classified as a Class IIIB liquid unless otherwise determined by testing.

610.2 Storage Tanks. Cooking oil storage tanks shall be listed in accordance with UL 142 or UL 80, and shall be installed in accordance with Section 5704 and the tank manufacturer's instructions.

610.3 Other Storage Components. Cooking oil storage system components, including but not limited to piping, connections, fittings, valves, tubing, and other related components used for the transfer of cooking oil from the cooking appliance to the storage tank, and from the storage tank to the discharge point, shall be installed in accordance with Section 5703.6.

610.4 Tank Venting. Normal and emergency venting for cooking oil storage tanks shall terminate outside the building as specified in Sections 5704.2.7.3 and 5704.2.7.4.

610.5 Electrical Equipment. Electrical equipment used for the operation and heating of the cooking oil storage system shall be listed and comply with NFPA 70.



Cooking oil storage tank and oil recovery cart *(Photograph courtesy of Darling International Inc., Irving, TX)*

CHANGE SIGNIFICANCE: Used cooking oil has benefits in that it can be recycled and used again for commercial cooking operations. It can also be chemically modified into biodiesel and used to fuel mobile or stationary equipment. Because it can be recycled and reused, many restaurants and similar businesses that perform commercial cooking operations have found that capturing used cooking oil reduces waste disposal costs. As a result, the food service industry is seeking options for the storage of waste cooking oils. The requirements in IFC Section 610 address the indoor and outdoor storage of cooking oils.

This code change specifies that for the application of these requirements, all cooking oils are classified as Class III-B combustible liquids in accordance with the definition in IFC Section 202. These liquids have a closed-cup flashpoint temperature greater than 200°F. Flashpoint and ignition temperatures for common cooking oils are shown in Table 610-A, and research confirms this classification is correct.[2]

[2]Simpson, Larry, *Commercial Cooking Operations Application Guide*, International Code Council, Washington, DC, 2010, p. 5.

610 continues

610 continued

TABLE 610-A Cooking Oil Flashpoint and Ignition Temperatures

Cooking Oil	Flashpoint Temperature (°F)	Ignition Temperature (°F)
Canola Oil	450	626
Corn Oil	490	740
Cotton Seed Oil	486	650
Palm Oil	323	600
Peanut Oil	540	833
Soybean Oil	549	833
Sunflower Seed Oil	550	Undetermined

Section 610.2 requires storage tanks for cooking oil storage to be listed as complying with either Underwriters Laboratories (UL) 142, *Standard for Steel Aboveground Storage Tanks for Flammable and Combustible Liquids,* or UL 80, *Standard for Steel Tanks for Oil-Burner Fuels and Other Combustible Liquids.* Both standards are limited to shop-fabricated aboveground storage tanks (ASTs) designed to operate at atmospheric pressure. Both standards require tanks to be constructed of carbon steel meeting a certain specification, be liquid-tight, and, before shipment, tested at the factory to confirm they are liquid-tight. Tanks constructed to UL 80 have a maximum volume of 660 gallons versus UL 142, which does not limit the volume of ASTs.

Installations of ASTs for cooking oil also must comply with the requirements in Section 5704 for storage tanks and the manufacturer's installation instructions. ASTs are available for indoor and outdoor installations. Section 5707.2.10 requires drainage and diking for cooking oil ASTs installed outdoors; Exception 2 to this section waives the requirement when the AST is a listed secondary tank.

Section 610.4 requires the tank to be equipped with a normal and emergency vent. The normal vent for cooking oil ASTs installed indoors is not required to be terminated outside the building when it is equipped with a pressure/vacuum vent (see Section 5704.2.7.3.3). All ASTs for cooking oil require an emergency vent in accordance with Section 5704.2.7.4.

Many cooking oil storage tank systems will contain internal heaters to keep the oil above its melting temperature so it can be removed by a vacuum truck. Section 610.5 reqnires the electrical equipment to be listed and its design and installation to comply with the NEC. This provision does not require any temperature controls that ensure the cooking oil is not heated above its flashpoint temperature.

The phrase "cooking oil storage tank" implies that it is listed as a complete assembly, but such an assumption is incorrect. Code officials will need to evaluate the tank, piping, valves, and fittings, as well as the electrical equipment, for compliance with the IFC and the NEC. Additionally, installation of the AST and its piping will require an IFC construction permit in accordance with Section 105.7.8.

5705.5

Alcohol-Based Hand Rubs Classified as Class I or II Liquids

CHANGE TYPE: Modification

CHANGE SUMMARY: Requirements for touch-free alcohol-based hand rubs have been included in the IFC.

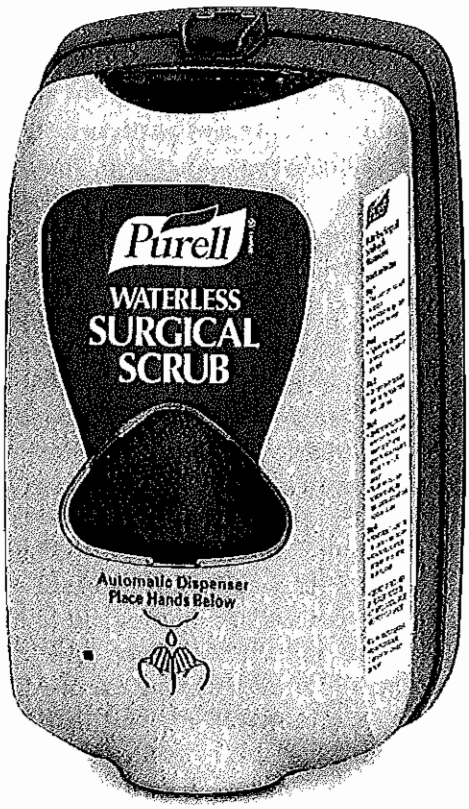
2012 CODE: 5702.1 Definitions. The following ~~words and~~ terms ~~shall, for the purposes of this section and as used elsewhere in this code, have the meanings shown herein~~ are defined in Chapter 2:

> **ALCOHOL-BASED HAND RUB.** An alcohol-containing preparation designed for application to the hands for reducing the number of viable microorganisms on the hands and containing ethanol or isopropanol in an amount not exceeding ~~70~~ 95 percent by volume.

5705.5 Alcohol-Based Hand Rubs Classified as Class I or II Liquids. The use of wall-mounted dispensers containing alcohol-based hand rubs classified as Class I or II liquids shall be in accordance with all of the following:

1. The maximum capacity of each dispenser shall be 68 ounces (2 L).
2. The minimum separation between dispensers shall be 48 inches (1219 mm).

5705.5 continues



Touch-free alcohol-based disinfectant dispenser. *(Courtesy of Gojo Industries, Akron, OH)*

5705.5 continued

3. The dispensers shall not be installed directly adjacent to, directly above or below an electrical receptacle, switch, appliance, device or other ignition source. The wall space between the dispenser and the floor shall remain clear and unobstructed.
4. Dispensers shall be mounted so that the bottom of the dispenser is a minimum of 42 inches (1067 mm) and a maximum of 48 inches (1219 mm) above the finished floor.
5. Dispensers shall not release their contents except when the dispenser is manually activated. Facilities shall be permitted to install and use automatically activated "Touch Free" alcohol based hand-rub dispensing devices with the following requirements:
   - 5.1. The facility or persons responsible for the dispensers shall test the dispensers each time a new refill is installed in accordance with the manufacturer's care aud use instructions.
   - 5.2. Dispensers shall be designed and must operate in a manner that ensures accidental or malicious activations of the dispensing device are minimized. At a minimum, all devices subject to or used in accordance with this section shall have the following safety features:
     - 5.3.1. Any activations of the dispenser shall only occur when an object is placed within four inches of the sensing device.
     - 5.3.2. The dispenser shall not dispense more than the amount required for hand hygiene consistent with label instructions as regulated by the United States Food and Drug Administration (USFDA).
     - 5.3.3. An object placed within the activation zone and left in place will cause only one activation.
6. Storage and use of alcohol-based hand rubs shall be in accordance with the applicable provisions of Sections 3404 and 3405.
7. Dispensers installed in occupancies with carpeted floors shall only be allowed in smoke compartments or *fire areas* equipped throughout with an *approved* automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2.

CHANGE SIGNIFICANCE: Alcohol-based hand rnbs (ABHRs) are essential in care occupancies for controlling the spread of unwanted infectious microorganisms. Numerous studies condncted on the nse ABHRs have found that they provide a vastly innproved efficacy against numerous pathogens and are more effective for a longer time period when compared to hand-washing with soap and water.

As part of their ongoing research to control the outbreak of mnltiple-drug-resistant bacteria, snch as vancoymin-resistant enterococcus (VRE) and similar "super bugs," that are highly resistant to antibiotics, the U.S. Centers for Disease Control and the U.S. Food and Drug Administration have been continning to study the performance of ABHRs. As a result of their research, both agencies now recommend that the concentration of ethanol or isopropanol in ABHR be increased to 95% by volume. Their research has found that a higher alcohol concentration offers much more virucidal activity when compared to ABHRs formnlated with 70% alcohol by volume. To help protect health care workers, hospital patients, and

long-term care residents against health-care-acquired infections, the definition of ABHR in Section 202 was revised to increase the permissible volume of ethyl or isopropyl alcohol from 70% to 95%. ABHRs formulated at this concentration are classified as Class IB flammable liquids.

Because of the increased volume of alcohol in ABHRs, the heat release rate and burning time of 95% ethanol was calculated and compared to that of weaker solutions found in older ABHRs. The calculations confirmed that 95% ethanol will exhibit the highest heat release when compared to more dilute ethanol/water solutions but exhibits the shortest-duration pool fire because the lack of water allows for quicker volatilization of the fuel.

The provisions in Section 5705.5 were modified to address the installation of "touch-free" ABHRs. Touch-free ABHRs were developed to eliminate the need for persons to touch the dispenser, which creates a potential path for passing of microorganisms. The devices are generally activated by passing the hands in front of or under an optical scanner, which activates and dispenses a specified dose of ethanol or isopropanol. In addition to compliance with all seven of the requirements in Section 5705.5, these particular ABHRs are required by Item 5.1 to be tested each time the dispenser is refilled in accordance with the manufacturer's care and use instructions. To prevent accidental activation of the device in the event a cart is pushed near a touch-free ABHR, Item 5.3.1 only allows dispensing to occur within 4 inches of the device. If a cart or other obstruction is located close enough to activate the ABHR, Item 5.3.3 limits the device to dispensing only a single dose—the dispenser must be designed so it does not continue to cycle and dispense additional doses of alcohol. Finally, Item 5.3.2 requires the discharged dose to be limited to the amount necessary for hand hygiene.

6104.3.1

Installation on Roof Prohibited

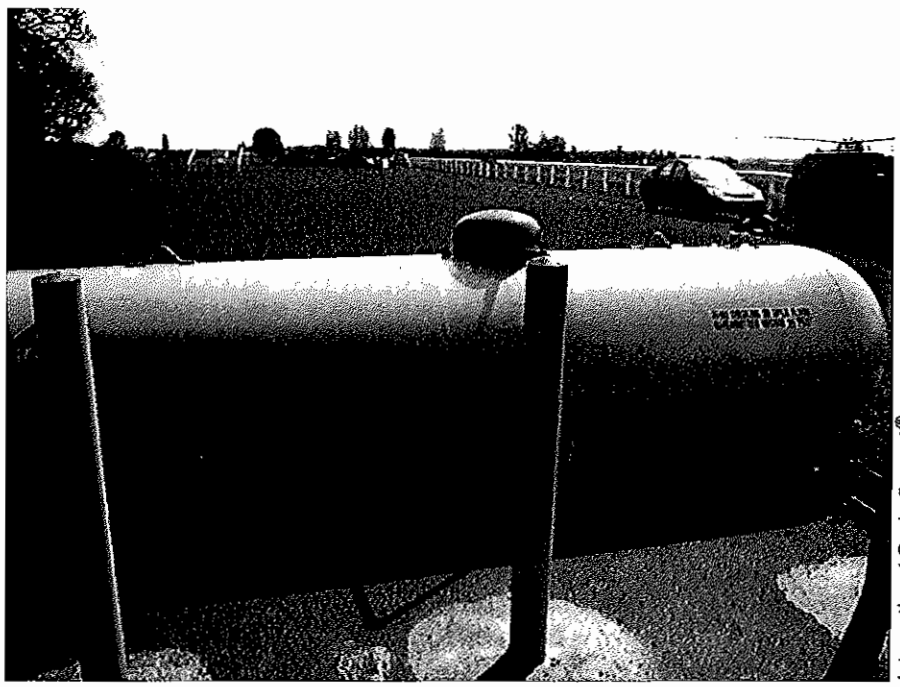
CHANGE TYPE: New

CHANGE SUMMARY: A stationary LP-gas installation on the roof of a building is not allowed.

2012 CODE: **6104.3.1 Installation on Roof Prohibited.** LP-gas containers used in stationary installations shall not be located on the roofs of buildings.

CHANGE SIGNIFICANCE: The IFC adopts NFPA 58, *Liquefied Petroleum Gas Code*, by reference, and many of its requirements are linked to specific provisions in Chapter 61. Liquefied petroleum gas (LP-gas) is a mixture of several flammable gases, including ethane, propane, and butane. LP-gas is a liquefied compressed gas as defined in Section 202 because it is stored as a liquid in a low-pressure gas cylinder or tank. It can be withdrawn as either liquid or gas depending on the cylinder or container design. LP-gas has an approximate vapor density of 1.52 (with air = 1), making it heavier than air, and an approximate flammable range of 2.0% to 10.1% by volume in air. NFPA 58 requires LP-gas to be odorized before it is made available to consumers so that they can detect a leak with their olfactory senses—in the general population, detection of the odorant generally occurs at 20% to 25% of the gas mixture's lower flammable limit.

A stationary LP-gas installation is defined in NFPA 58 as "*an installation of LP-gas containers, piping and equipment for indefinite use at a particular location; an installation is not normally expected to change in status, condition, or location.*" A stationary installation is assembled from



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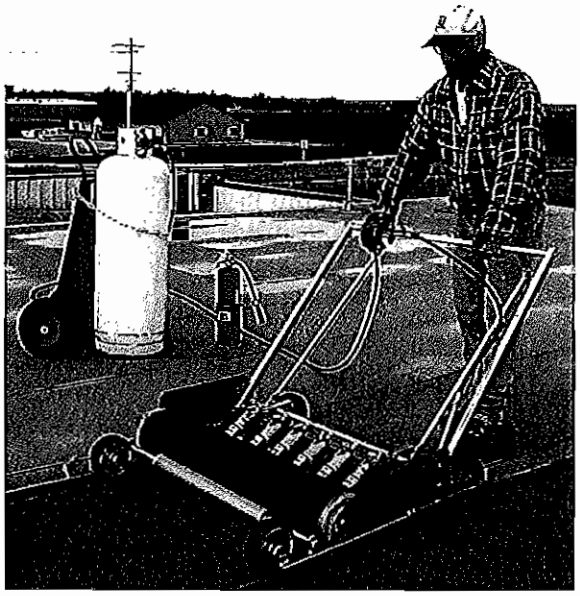
A 2000-gallon-water-capacity stationary ASME container is prohibited on the roof of a building.



Portable cylinders on roofs are not prohibited by Section 6104.3.1. *(Courtesy of Midwest Roofing Contractors Association, Glenview, IL)*

approved Department of Transportation (DOT) cylinders or ASME-compliant containers, piping, and equipment such as pressure regulators that remain on the site for an indefinite time period. Section 105.7.10 requires a construction permit for any LP-gas system.

Installation of stationary containers on the roof of buildings is prohibited by Section 6.6.7 of NFPA 58, unless such placement is specifically approved by the code official or authority having jurisdiction as well as the fire department. Only after approvals have been granted by the fire code official and fire department can consideration be given to installing a stationary container on a building roof. NFPA 58 limits these installations to a maximum of 4000-gallon water capacity and only allows them on the roof of Type I or II buildings with minimum 2-hour structural assemblies. Numerous other requirements for the arrangement of piping and valves, the preparation of a written fire safety analysis, and location of the stationary container are also specified in NFPA 58.

Based on Section 6104.3.2.1, stationary LP-gas containers are not permitted on the roof of any building. The IFC requirement takes precedence over the NFPA 58 requirements because of the code text in IFC Section 102.7.1.

Section 6104.3.2.1 does not prohibit the building owner or tenant from using LP-gas cylinders inside buildings or on roofs or balconies. LP-gas is commonly used by contractors for soldering water or refrigerant piping systems. Many roof covering systems are applied using LP-gas-fueled torch systems. These instances constitute hot work and must comply with the requirements in IFC Chapter 35; torch-applied roofing systems also need to comply with the requirements in Section 3317 for hot work. When LP-gas cylinders are required on a building roof or inside a building for maintenance or construction reasons, their on-site transportation and use should comply with the NFPA 58, Section 6.19 requirements for cyliuders, equipment, piping, and appliances in buildiugs, building roofs, and exterior balconies.

6109.15

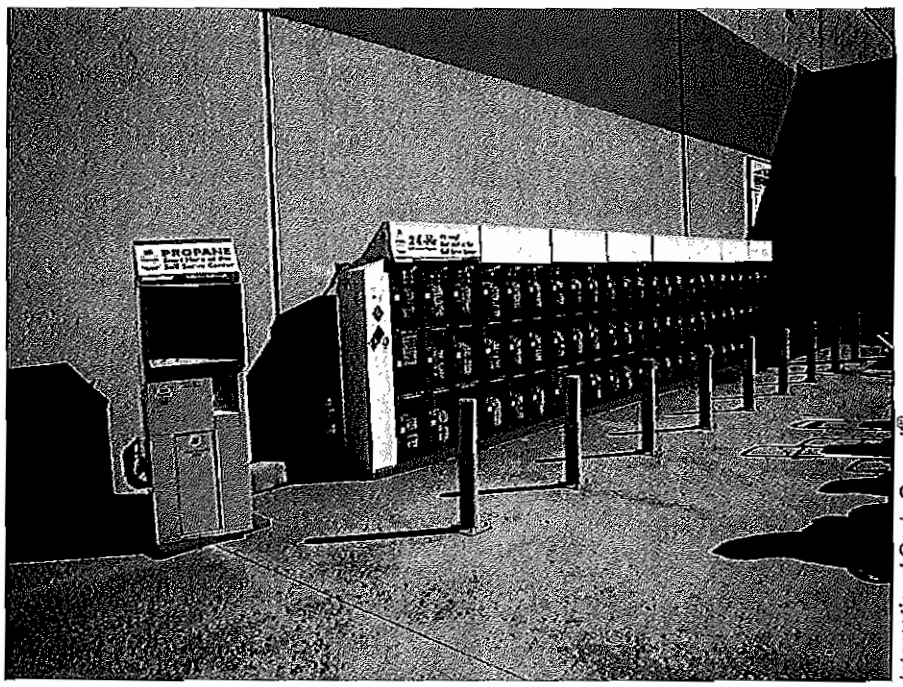
LP-Gas Cylinder Exchange for Resale

CHANGE TYPE: New

CHANGE SUMMARY: New requirements regulate the design, operation, and maintenance of automated cylinder exchange stations and the LP-gas exchange cabinets that are accessible to the public

2012 CODE: **6109.15 LP-Gas Cylinder Exchange for Resale.** In addition to other applicable requirements of this chapter, facilities operating cylinder exchange stations for LP-gas that are accessible to the public shall comply with the following requirements:

1. Cylinders shall be secured in a lockable, ventilated metal cabinet or other approved enclosure.
2. Cylinders shall be accessible only by authorized personnel or by use of an automated exchange system in accordance with Section 6109.15.1.
3. A sign shall be posted on the entry door of the business operating the cylinder exchange stating "DO NOT BRING LP-GAS CYLINDERS INTO THE BUILDING" or similar approved wording.
4. An emergency contact information sign shall be posted within 10 feet of the cylinder storage cabinet. The content, lettering, size, color and location of the required sign shall be as required by the fire code official.



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Automated cylinder exchange station

CHAPTER 3

COMPLIANCE METHODS

**

SECTION 301
COMPLIANCE METHODS

301.1 General. The *repair, alteration, change of occupancy, addition* or relocation of all *existing buildings* shall comply with one of the methods listed in Sections 301.1.1 through 301.1.3 as selected by the applicant. Application of a method shall be the sole basis for assessing the compliance of work performed under a single permit unless otherwise approved by the *code official.* Sections 301.1.1 through 301.1.3 shall not be applied in combination with each other. Where this code requires consideration of the seismic force-resisting system of an *existing building* subject to *repair, alteration, change of occupancy, addition* or relocation of *existing buildings*, the seismic evaluation and design shall be based on Section 301.1.4 regardless of which compliance method is used.

Exception: Subject to the approval of the *code official*, *alterations* complying with the laws in existence at the time the building or the affected portion of the building was built shall be considered in compliance with the provisions of this code unless the building is undergoing more than a limited structural *alteration* as defined in Section 907.4.3. New structural members added as part of the *alteration* shall comply with the *International Building Code. Alterations* of *existing buildings* in *flood hazard areas* shall comply with Section 701.3.

301.1.1 Prescriptive compliance method. *Repairs, alterations, additions* and *changes of occupancy* complying with Chapter 4 of this code in buildings complying with the *International Fire Code* shall be considered in compliance with the provisions of this code.

301.1.2 Work area compliance method. *Repairs, alterations, additions*, changes in occupancy and relocated buildings complying with the applicable requirements of Chapters 5 through 13 of this code shall be considered in compliance with the provisions of this code.

301.1.3 Performance compliance method. *Repairs, alterations, additions*, changes in occupancy and relocated buildings complying with Chapter 14 of this code shall be considered in compliance with the provisions of this code.

[B] 301.1.4 Evaluation and design procedures. The seismic evaluation and design shall be based on the procedures specified in the *International Building Code*, ASCE 31 or ASCE 41. The procedures contained in Appendix A of this code shall be permitted to be used as specified in Section 301.1.4.2.

[B] 301.1.4.1 Compliance with IBC level seismic forces. Where compliance with the seismic design provisions of the *International Building Code* is required, the procedures shall be in accordance with one of the following:

1. One-hundred percent of the values in the *International Building Code*. Where the existing seismic force-resisting system is a type that can be designated as "Ordinary," values of R, Ω_0 and C_d used for analysis in accordance with Chapter 16 of the *International Building Code* shall be those specified for structural systems classified as "Ordinary" in accordance with Table 12.2-1 of ASCE 7, unless it can be demonstrated that the structural system will provide performance equivalent to that of a "Detailed," "Intermediate" or "Special" system.
2. Compliance with ASCE 41 using both the BSE-1 and BSE-2 earthquake hazard levels and the corresponding performance levels shown in Table 301.1.4.1.

[B] 301.1.4.2 Compliance with reduced IBC level seismic forces. Where seismic evaluation and design is permitted to meet reduced *International Building Code* seismic force levels, the procedures used shall be in accordance with one of the following:

1. The *International Building Code* using 75 percent of the prescribed forces. Values of R, Ω_0 and C_d used for analysis shall be as specified in Section 301.1.4.1 of this code.
2. Structures or portions of structures that comply with the requirements of the applicable chapter in Appendix A as specified in Items 2.1 through 2.5 and subject to the limitations of the respective

[B] TABLE 301.1.4.1
PERFORMANCE CRITERIA FOR IBC—LEVEL SEISMIC FORCES OCCUPANCY

RISK CATEGORY (Based on IBC Table 1604.5)	PERFORMANCE LEVEL FOR USE WITH ASCE 41 BSE-1 EARTHQUAKE HAZARD LEVEL	PERFORMANCE LEVEL FOR USE WITH ASCE 41 BSE-2 EARTHQUAKE HAZARD LEVEL
I	Life safety (LS)	Collapse prevention (CP)
II	Life safety (LS)	Collapse prevention (CP)
III	Note a	Note a
IV	Immediate occupancy (IO)	Life safety (LS)

a. Acceptance criteria for Risk Category III shall be taken as 80 percent of the acceptance criteria specified for Risk Category II performance levels, but need not be less than the acceptance criteria specified for Risk Category IV performance levels.

Appendix A Chapters shall be deemed to comply with this section.

2.1. The seismic evaluation and design of unreinforced masonry bearing wall buildings in Risk Category I or II are permitted to be based on the procedures specified in Appendix Chapter A1.

2.2. Seismic evaluation and design of the wall anchorage system in reinforced concrete and reinforced masonry wall buildings with flexible diaphragms in Risk Category I or II are permitted to be based on the procedures specified in Chapter A2.

2.3. Seismic evaluation and design of cripple walls and sill plate anchorage in residential buildings of light-frame wood construction in Risk Category I or II are permitted to be based on the procedures specified in Chapter A3.

2.4. Seismic evaluation and design of soft, weak, or open-front wall conditions in multiunit residential buildings of wood construction in Risk Category I or II are permitted to be based on the procedures specified in Chapter A4.

2.5. Seismic evaluation and design of concrete buildings in all risk categories are permitted to be based on the procedures specified in Chapter A5.

3. Compliance with ASCE 31 based on the applicable performance level as shown in Table 301.1.4.2. It shall be permitted to use the BSE-1 earthquake hazard level as defined in ASCE 41 and subject to the limitations in Item 4 below.

4. Compliance with ASCE 41 using the BSE-1 Earthquake Hazard Level and the performance level shown in Table 301.1.4.2. The design spectral response acceleration parameters S_{XS} and S_{X1} specified in ASCE 41 shall not be taken less than 75 percent of the respective design spectral response acceleration parameters S_{DS} and S_{D1} defined by the *International Building Code*.

301.2 Additional codes. *Alterations, repairs, additions* and *changes of occupancy* to, or relocation of, *existing buildings* and structures shall comply with the provisions for *alterations, repairs, additions* and *changes of occupancy* or relocation, respectively, in this code and the *International Energy Conservation Code, International Fire Code, International Fuel Gas Code, International Mechanical Code, International Plumbing Code, International Property Maintenance Code, International Private Sewage Disposal Code, International Residential Code* and NFPA 70. Where provisions of the other codes conflict with provisions of this code, the provisions of this code shall take precedence.

[B] TABLE 301.1.4.2
PERFORMANCE CRITERIA FOR REDUCED IBC—LEVEL SEISMIC FORCES RISK CATEGORY

RISK CATEGORY (Based on IBC Table 1604.5)	PERFORMANCE LEVEL FOR USE WITH ASCE 31	PERFORMANCE LEVEL FOR USE WITH ASCE 41 BSE-1 EARTHQUAKE HAZARD LEVEL
I	Life safety (LS)	Life safety (LS)
II	Life safety (LS)	Life safety (LS)
III	Notes a, b	Note a
IV	Immediate occupancy (IO)	Immediate occupancy (IO)

a. Acceptance criteria for Risk Category III shall be taken as 80 percent of the acceptance criteria specified for Risk Category II performance levels, but need not be less than the acceptance criteria specified for Risk Category IV levels.

b. For Risk Category III, the ASCE 31 screening phase checklists shall be based on the life safety performance level.

CHANGE TYPE: Modification

CHANGE SUMMARY: The prescriptive insulation and fenestration Table R402.1.1 has been modified with half of the values left unchanged.

2012 CODE:

Table R402.1.1

R-value Computation for Building Thermal Envelope

TABLE R402.1.1 Insulation and Fenestration Requirements by Component[a]

Climate Zone	Fenestration *U*-Factor[b]	Skylight[b] *U*-Factor	Glaze Defenestration SHGC[b, e]	Ceiling *R*-Value	Wood Frame Wall *R*-Value	Mass Wall *R*-Value[i]	Floor *R*-Value	Basement[c] Wall *R*-Value	Slab[d] *R*-Value & Depth	Crawl Space[c] Wall *R*-Value
1	~~1.2~~ NR	0.75	~~0.30~~ 0.25	30	13	3/4	13	0	0	0
2	~~0.65~~ 0.40	~~0.75~~ 0.65	~~0.30~~ 0.25	~~30~~ 38	13	4/6	13	0	0	0
3	~~0.50~~ 0.35	~~0.65~~ 0.55	0.30 0.25	3038	~~13~~ 20 or 13 + 5[h]	~~5/8~~ 8/13	19	5/13[f]	0	5/13
4 except Marine	0.35	~~0.60~~ 0.55	~~NR~~ 0.40	~~38~~ 49	~~13~~ 20 or 13 + 5[h]	~~5/10~~ 8/13	19	10 /13	10, 2 ft	10/13
5 and Marine 4	~~0.35~~ 0.32	0.60 0.55	NR	~~38~~ 49	20 or 13 + 5[h]	13/17	30[g]	15/ 19	10, 2 ft	~~10/13~~ 1/19
6	~~0.35~~ 0.32	~~0.60~~ 0.55	NR	49	~~20 or 13 + 5~~ 20 + 5 or 13 + 10[h]	~~15/19~~ 15/20	30[g]	15/ 19	10, 4 ft	~~10/13~~ 1/19
7 and 8	~~0.35~~ 0.32	~~0.60~~ 0.55	NR	49	~~21~~ 20 + 5 or 13 + 10[h]	19/21	38[g]	15/ 19	10, 4 ft	~~10/13~~ 1/19

See Table R402.1.1 Footnotes section on page 95

CHANGE SIGNIFICANCE: The format is unchanged, as are half of the values. A major change is that compliance with the wood frame wall values in Climate Zones 3, 4, and 5 may not be, and Climate Zones 6 through 8 cannot be met using this Table without the addition of continuous insulation. It should also be noted that 2 × 6 framing might be necessary for wall assemblies for some of the options in Climate Zones 3 through 8, depending on the choice of cavity insulation.

Building science principles should be considered when evaluating building envelope alternatives. Calculations related to the dew point location in the wall, as well as the vapor permeability of envelope components, will help to identify the location of potential moisture condensation and the path for moisture movement.

Table R402.1.1 continues

Table R402.1.1 continued

When approved by the Code Official based on equivalency and intent of the code, alternative methods of construction, materials, and insulation systems may also be used as an alternative to the prescriptive *R*-values of Table R402.1.1. For example, designers may substitute greater stud spacing, insulated plates and insulated headers in walls as an alternative to the prescribed cavity and/or continuous insulation.

ICC-ES issued Environmental Criteria 115 (EC115) to address these issues, which provides multiple options and compliance alternatives. ICC-ES may benchmark and provide a Verification of Attributes Report (VAR) on assembly configurations for compliance with the tabular *R*-values.

The full text of EC115, environmental criteria for determination of equivalent wood frame wall assemblies to the prescriptive building thermal envelope requirements of *The International Energy Conservation Code®* and *International Residential Code®*, EC115, Effective date: October 1, 2012, is available from ICC-ES.

For additional discussion regarding the prescriptive compliance paths available for roof assemblies, refer can be made to *Guidelines for Complying with Energy Code Requirements for Roof Assemblies: International Energy Conservation Code, 2009 and 2012 Editions*, © 2012 by the National Roofing Contractors Association.

CHANGE TYPE: Modification

CHANGE SUMMARY: As always the footnotes are as important as the table they modify.

Table 402.1.1
Footnotes

- Footnote a notes the reduction in *R*-value when batt insulation is compressed. (See table below for examples)
- Footnote b allows the exclusion of certain skylights from the Solar Gain Heat Coefficient (SHGC) requirements in Climate Zones 1 to 3.
- Footnote h has been completely reworked to allow for consistent sheathing thickness while maintaining wall bracing.
- Footnote j, regarding impact rated fenestration, has been deleted.

Nominal Lumber Size	Cavity Depth	Insulation R-Values When Compressed In Framing Cavity											
2 x 12	11 ¼"	37	38										
2 x 10	9 ¼"	32	35	28									
2 x 8	7 ¼"	27	29	25	27	24							
2 x 6	5 ½"			21	22	20	19	21	18				
2 x 4	3 ½"						14	15	13	15	13	11	
2 x 3	2 ½"									11	10	8.9	8.0
2 x 2	1 ½"										6.6	6.1	5.7
2 x 1	¾"												3.3
Product R-Value		R-38	R-38C	R-30	R-30C	R-25	R-22	R-21	R-19	R-15	R-13	R-11	R-8
Label Thickness		12"	10 ¼"	9 ½"	8 ¼"	8"	6 ¾"	5 ½"	6 ¼"	3 ½"	3 ½"	3 ½"	2 ½"

Notes: 1. Minimum dressed lumber thickness per U.S. Dept. of Commerce/NIST publication PS 20-10.
2. Above listing for information only; some products will resist compression into framing cavities.

Batt insulation R-values are reduced significantly when the material is compressed.

2012 CODE: Table R402.1.1 Footnotes

a. *R*-values are minimums. *U*-factors and SHGC are maximums. ~~R-19 batts compressed into a nominal 2 × 6 framing cavity such that the *R*-value is reduced by R-1 or more shall be marked with the compressed batt *R*-value in addition to the full thickness *R*-value.~~ When insulation is installed in a cavity which is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall not be less than the *R*-value specified in the table.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: Skylights may be excluded from glazed fenestration SHGC requirements in Climate Zones 1 through 3 where the SHGC for such skylights does not exceed 0.30.

h. First value is cavity insulation, second is continuous insulation or insulated siding, so "13 + 5" means R-13 cavity insulation plus R-5 continuous insulation or insulated siding. If structural sheathing covers ~~more than 25 percent of exterior, structural sheathing shall be supplemented~~

Table 402.1.1 continues

Table 402.1.1 continued

~~with insulated sheathing of at least R-2.~~ 40 percent or less of the exterior, continuous insulation *R*-value shall be permitted to be reduced by no more than R-3 in the locations where structural sheathing is used — to maintain a consistent total sheathing thickness.

j. ~~For impact rated fenestration complying with Section R301.2.1.2 of the *International Residential Code* or Section 1608.1.2 of the *International Building Code*, the maximum *U*-factor shall be 0.75 in Zone 2 and 0.65 in Zone 3.~~

CHANGE SIGNIFICANCE: Footnote a. The requirements for compressed batt insnlation are now very clear: the insulation still needs to provide the full value as required by the table. Labeling per Section R303.1.2 may or may not indicate the compressed *R*-value of the insulation. It will be incumbent on the permit holder to provide documentation of the compressed *R*-values.

Footnote b. In Climate Zones 1 to 3, there is an allowance in the skylight SHGC requirement from 0.25 up to 0.30. This seems to be a concession to product availability, in that many of the commercially available skylight assemblies appear to be in the SHGC range of 26 to 30.

Footnote h. A 13+5 assembly can be reduced to 13+2 for up to 40 percent of the exterior of a structure, where structural sheathing is utilized for compliance with the bracing requirements found in Chapter 6 of the International Residential Code.

Footnote j. The *U*-factor reduction for impact-rated fenestration has been deleted; impact-rated fenestration is now considered the same as all other fenestration.

R402.4.1

Building Thermal Envelope

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Air barrier and insulation performance is primarily an issue with workmanship. Good inspections and testing will find problems like this.

CHANGE TYPE: Modification

CHANGE SUMMARY: There is now no option for testing OR visual inspection. The requirement is now testing AND visual iuspection. The code official is authorized to require au *approved* third party to inspect and verify.

2012 CODE: R402.4.1 Building Thermal Envelope. The *building thermal envelope* shall ~~be durably sealed to limit infiltration~~ comply with Sections R402.4.1.1 and R402.4.1.2. The sealiug methods between dissimilar materials shall allow for differential expansion and contraction. ~~The following shall be caulked, gasketed, weatherstripped or otherwise sealed with an air barrier material, suitable film or solid material:~~

~~1. All joints, seams and penetrations.~~

~~2. Site-built windows, doors and skylights.~~

~~3. Openings between window and door assemblies and their respective jambs and framing.~~

~~4. Utility penetrations.~~

~~5. Dropped ceilings or chases adjacent to the thermal envelope.~~

~~6. Knee walls.~~

~~7. Walls and ceilings separating a garage from conditioned spaces.~~

~~8. Behind tubs and showers on exterior walls.~~

~~9. Common walls between dwelling units.~~

~~10. Attic access openings.~~

~~11. Rim joist junction.~~

~~12. Other sources of infiltration.~~

R402.4.1.1 Installation. The components of the *building thermal envelope*, as listed in Table R402.4.1.1, shall be installed in accordance with the manufacturer's instructions and the criteria listed in Table R402.4.1.1, as applicable to the method of construction. Where required by the *code official*, an *approved* third party shall inspect all components and verify compliance.

TABLE 402.4.2 R402.4.1.1 Air Barrier and Insulation Installation

Compenent	Criteria[a]
Air barrier and thermal barrier	~~Exterior thermal envelope insulation for framed walls is installed in substantial contact and continuous alignment with building envelope air barrier.~~ ~~Breaks or joints in the air barrier are filled or repaired.~~ ~~Air-permeable insulation is inside of an air barrier.~~ A continuous air barrier shall be installed in the building envelope. Exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier ~~are filled or repaired~~ shall be sealed. Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling/soffit ~~is substantially~~ shall be aligned with the insulation and any gaps are in the air barrier sealed. ~~Attic access (except unvented attic) knee wall, or~~ Access openings, drop-down stair is or knee wall doors to unconditioned attic spaces shall be sealed.
Walls	Corner sand headers ~~are~~ shall be insulated and the junction of the foundation and sill plate ~~is~~ shall be sealed. The junction of the top plate and top of exterior walls shall be sealed. Exterior thermal envelope insulation for framed walls shall be installer insubstantial contact and continuous alignment with the air barrier. Knee walls shall be sealed.
Windows, sky light sand doors	The Space between window/doorjambs and framing ~~is~~ and skylights and framing shall be sealed.
Rim joists	Rim joists ~~are~~ shall be insulated and include ~~an~~ the air barrier.
Floors (including above-garage and cantilevered floors)	Insulation ~~is~~ shall be installed to maintain permanent contact with underside of subfloor decking. The air barrier shall be installed at any exposed edge of insulation.
Crawl space walls	Where provided in lieu of floor insulation, insulation ~~is~~ shall be permanently attached to the crawl space walls. Exposed earth in unvented crawl spaces ~~is~~ shall be covered with a Class I vapor retarder with overlapping joints taped.
Shafts, penetrations	Ducts hafts, utility penetrations, and flue shafts opening to exterior or unconditioned space ~~are~~ shall be sealed.
Narrow cavities	Batts in narrow cavities ~~are~~ shall be cut to fit, or narrow cavities ~~are~~ shall be filled by sprayed~~/blown~~ insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing ~~is~~ shall be provided between the garage and conditioned spaces.
Recessed lighting	Recessed light fixtures installed in the building thermal envelope ~~are~~ shall be air tight, IC rated, and sealed to the dry wall. ~~Exception—fixtures in conditioned space.~~
Plumbing and wiring	~~Insulation is placed between outside and pipes.~~ Batt insulation ~~is~~ shall be cut neatly to fit around wiring and plumbing in exterior walls, or ~~sprayed/blown insulation extends~~ insulation that on installation readily conforms to available space shall extend behind piping and wiring.
Shower/tub on exterior wall	Exterior walls adjacent to showers and tubs ~~on exterior wall shave insulation~~ shall be insulated and the air barrier installed separating them from the ~~exterior wall~~ showers and tubs.
Electrical/phone box on exterior walls	The air barrier extends shall be installed behind electrical or communication boxes or air sealed boxes are shall be installed.
~~Common wall~~	~~Air barrier is installed in common wall between dwelling units.~~
HVAC register boots	HVAC register boots that penetrate building thermal envelope ~~are~~ shall be sealed to the sub floor dry wall.
Fireplace	~~Fire place walls include~~ An air barrier shall be installed on fireplace walls. Fireplaces shall have gasketed doors.

a. In addition, inspection of log walls shall be in accordance with the provisions of ICC-400.

R402.4.1 continues

R402.4.1 continued

CHANGE SIGNIFICANCE: The actual requirements of the table are largely unchanged. However, it should be noted that the fireplace component has a new item, gasketed doors. This requirement has been relocated from the text of R402.4.2.

R402.4.1.2

Testing-Air Leakage

CHANGE TYPE: Modification

CHANGE SUMMARY: The 2009 IECC introduced testing as an option. The 2012 IECC deletes the option and makes *both* inspection and testing mandatory while increasing the tightness requirements. It should be noted that in most, if not all, cases, mechanical ventilation will be required in houses that meet the air tightness requirements.

2012 **CODE:** ~~**402.4.2 Air sealing and insulation.** Building envelope air tightness and insulation installation shall be demonstrated to comply with one of the following options given by Section 402.4.2.1 or 402.4.2.2:~~

~~**402.4.2.1 Testing option.** Building envelope tightness and insulation installation shall be considered acceptable when tested air leakage is less than seven air changes per hour (ACH) when tested with a blower door at a pressure of 50 Pascals (1 psf). Testing shall occur after rough in and after installation of penetrations of the building envelope, including penetrations for utilities, plumbing, electrical, ventilation and combustion appliance~~

R402.4.1.2 Testing. The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding five air changes per hour in Climate Zones 1 and 2, and three air changes per hour in Climate Zones 3 through 8. Testing shall be conducted with a blower door at a pressure of 0.2 inches w.g. (50 Pascals). Where required by the code official, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*.

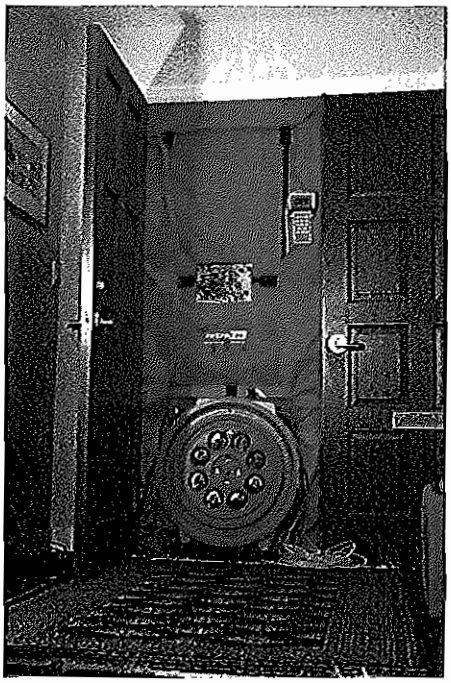
During testing:

1. Exterior windows and doors, fireplace, and stove doors shall be closed, but not sealed, beyond the intended weather-stripping or other infiltration control measures;
2. Dampers including exhaust, intake, makeup air, back draft, and flue dampers shall be closed, but not sealed beyond intended infiltration control measures;
3. Interior doors, if installed at the time of the test, shall be open;
4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
5. Heating and cooling systems, if installed at the time of the test, shall be turned off; and

~~6. HVAC ducts shall not be sealed; and~~

~~7~~ 6. Supply and return registers, if installed at the time of the test, shall be fully open.

~~**402.4.2.2 Visual inspection option.** Building envelope tightness and insulation installation shall be considered acceptable when the items listed in Table 402.4.2, applicable to the method of construction, are~~



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A blower door is used to test the tightness of the house

R402.4.1.2 continues

R402.4.1.2 continued

~~field verified. Where required by the *code official*, an *approved* party independent from the installer of the insulation shall inspect the air barrier and insulation.~~

2012 International Residential Code Section R303.4 Mechanical Ventilation. Where the air infiltration rate of a dwelling unit is less than five air changes per hour when tested with a blower door at a pressure of 0.2 inch w.c. (50 Pa) in accordance with *(IRC)* Section N1102.4.1.2, the dwelling unit shall be provided with whole-house mechanical ventilation in accordance with *(IRC)* Section M1507.3.

2012 International Residential Code Chapter 2 Definitions.

LOCAL EXHAUST. An exhaust system that uses one or more fans to exhaust air from a specific room or rooms within a dwelling.

WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM. An exhaust system, supply system, or combination thereof that is designed to mechanically exchange indoor air for outdoor air when operating continuously or through a programmed intermittent schedule to satisfy the whole-house ventilation rate. For definition applicable in *(IRC)* Chapter 11, see *(IRC)* Section N1101.9.

CHANGE SIGNIFICANCE: The testing requirement is not exclusive to the IECC. The 2012 *International Residential Code* Section R303.4 mandates a blower door test. An authorization is included for the code official to require an *approved* third party, for example a contractor with certification by a recognized association such as ResNet or Building Performance Institute. The significance of this provision cannot be underestimated. However, the building official should be aware the test methods and data sources may vary, even with certified personnel.

Air leakage and infiltration is the largest cause of uunecessary energy loss in residential buildings. This section addresses the quality of workmanship that has been invested in the project. Two seemingly identical residential buildings may have enormously different test results and subsequent operational costs. Testing and inspection, when done together, provide the home owner with measurable and objective assurance that he/she is gettiug the product quality that is anticipated.

R403.2

Duct Construction and Sealing

CHANGE TYPE: Modification

CHANGE SUMMARY: In order to properly address the changes in this section, the comments are broken into two portions. This first portion addresses construction and sealing. The second will address tightness verification.

I. In order to understand the intent of this provision, the reader should become familiar with the referenced sections of the IRC and IMC; they are NOT identical. Please refer to the *Significant Changes* publications for each of these codes for a more detailed discussion. Although the referenced codes are not identical, they do result in substantially similar construction:
   - *SMACNA HVAC Duct Construction Standards—Metal and Flexible and NAIMA Fibrous Glass Duct Construction Standards are referenced*
   - *UL-181 A listing is required for Duct Board construction.*
   - *UL-181B listing is flexible construction.*
   - *Unlisted duct tape is prohibited on any duct.*
   - *An exception for certain longitudinal seams (found in this section's exceptions).*

II. The three exceptions, new to the IECC, are common with the 2012 IRC (*including the one found in the IMC).

III.
   1. Air-impermeable spray foam products
   2. Where a duct connection is made partially inaccessible
   3. **Continuously welded and locking longitudinal joints*

R403.2 continues

Tapes may appear to be identified by a manufacturer as suitable for metal, however a closer reading will show that it has been labeled to transition metal to flex, and nothing else. Some manufacturers have also been known to include logos for which they have not been authorized.

R403.2 continued

IV. Air handlers shall have the manufacturer's designation for an air leakage of no more than 2 percent ...

V. Building framing cavities may not be used as ducts or plenums (supply or return).

2012 CODE: R403.2 Ducts. Ducts and air handlers shall be in accordance with Sections R403.2.1 through R403.2.3.

R403.2.2 Sealing (Mandatory). ~~All~~ Ducts, air handlers, and filter boxes ~~and building cavities used as ducts shall be sealed~~ shall be sealed. Joints and seams shall comply with either the *International Mechanical Code* or ~~Section M1601.4.1 of the~~ *International Residential Code*, as applicable.

Exceptions:

1. Air-impermeable spray foam products shall be permitted to be applied without additional joint seals.
2. Where a duct connection is made that is partially inaccessible, three screws or rivets shall be equally spaced on the exposed portion of the joint so as to prevent a hinge effect.
3. Continuously welded and locking-type longitudinal joints and seams in ducts operating at static pressures less than 2 inches of water column (500 Pa) pressure classification shall not require additional closure systems.

Duct tightness shall be verified by either of the following. *(Verification is addressed in the next section.)*

R403.2.2.1 Sealed Air Handler. Air handlers shall have a manufacturer's designation for an air leakage of no more than 2 percent of the design air flow rate when tested in accordance with ASHRAE 193.

R403.2.3 Building Cavities (Mandatory). Building framing cavities shall not be used as ~~supply~~ ducts or plenums.

CHANGE SIGNIFICANCE:

I. The IMC and IRC both clearly state that UNLISTED tape is not permitted as a sealant on any duct. It should be clear that a product used outside of the scope of its listing is unlisted for that application. As of this printing, no company has been able to document a verified listing for metal-to-metal taped connections. Without that listing, a taped metal-to-metal joint is in violation of IRC, IMC, and IECC. The tape choices appear to be nonexistent; however, there are other code-compliant methods and materials available.

II. The exceptions:

NOTE: These exceptions do not apply to the tightness verification requirement found in the second portion of this section. Any system that is not completely within the *building thermal envelope* shall be tested for tightness.

1. *"Air-impermeable spray foam products..."* will primarily be of benefit for construction utilizing air-impermeable spray foam as the building thermal envelope insulation. Ducts completely embedded in impermeable insulation do not need to be redundantly sealed prior to installation of the insulation.

   NOTES:

   i. Inspector should verify joints are completely covered and

   ii. Not all foams are air-impermeable; for example, many of the open cell foams are considered to be air-permeable and would not be acceptable.

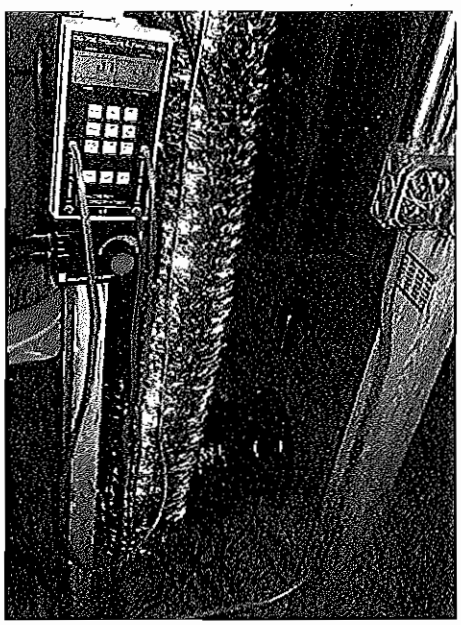
2. *"Where a duct connection is made partially inaccessible, three screws or rivets...equally spaced..."* may serve as the mechanical connection. This exception is a duct CONSTRUCTION provision and does not anticipate screws or rivets as the sealing method. The connection will need to be sealed and tested, unless otherwise excepted below.
3. *"Continuously welded and locking longitudinal joints..."* (seams running the long direction of the duct work) are stipulated as the only type available for this exception. All others must be sealed in the field at the time of installation.

III. "Air Handlers shall have the manufacturer's designation for an air leakage of no more than 2 percent." This will be a specification and plan review issue.

IV. In the 2012 IECC, this Mandatory provision now prohibits the use of building cavities for any supply or return utilization. In short, all air transfer must be contained within dedicated dnct or plenum material.

R403.2

Duct Tightness Verification



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This is a Rough-in Total Leakage test, without the air handler installed. The blower and manometer are the only equipment required

CHANGE TYPE: Modification

CHANGE SUMMARY: In order to properly address the changes in this section, the comments are broken into two portions. The first portion (above) addressed construction and sealing. This second will now address the changes in tightness verification.

1. In the 2009 IECC, there were two acceptable test methods:
   a. Leakage to outdoors, utilizing both a blower door and duct blower.
   b. Total leakage, pressurizing the ducts only.
   In the 2012 IECC, total leakage is the only acceptable test method.
2. The allowable leakage performauce nuuibers have been improved.

2012 CODE: R403.2 Ducts. Ducts and air handlers shall be in accordance with Sections R403.2.1 through R403.2.3.

R403.2.2 Sealing (Mandatory). ~~All~~ Ducts, air handlers, and filter boxes ~~and building cavities used as ducts shall be sealed~~ shall be sealed. Joiuts and seams shall comply with either the *International Mechanical Code* or ~~Section M1601.4.1 of the~~ *International Residential Code*, as applicable. *(Construction and sealing requirements are addressed in the previous section)*

Duct tightness shall be verified by either of the following:

1. Post construction test: ~~Leakage to outdoors shall be less than or equal to 8 cfm (226.5 L/min) per 100 ft² (9.29 m²) of conditioned floor area or a~~ Total leakage shall be less than or equal to ~~12cfm (12 L/min)~~ 4 cfm (113.3 L/min) per 100 square feet (9.29 m^2) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test.
2. Rough-in test: Total leakage shall be less than or equal to ~~6cfm (169.9 L/min)~~ 4 cfm (113.3 L/min) per 100 square feet (9.29 m^2) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the system, iucluding the manufacturer's air handler enclosure. All registers shall be taped or otherwise sealed during the test. If the air handler is not installed at the time of the test, total leakage shall be less than or equal to ~~4 cfm (113.3 L/min)~~ 3 cfm (85 L/min) per 100 square feet (9.29 m^2) of conditioned floor area.

Exception: ~~Duct tightness~~ The total leakage test is not required for ducts and air handlers located entirely within the ~~conditioned space~~ building thermal envelope.

CHANGE SIGNIFICANCE: There is only one approved method of testing; Total Leakage.

NOTE: Please remember that the "conditioned floor area" referenced in this provision is the space *served by the one specific HVAC unit being tested.* The floor area used to size each piece of equipment per Section R403.6 should correlate with the floor area for the test.

R403.5

Mechanical Ventilation (Mandatory)

CHANGE TYPE: Addition

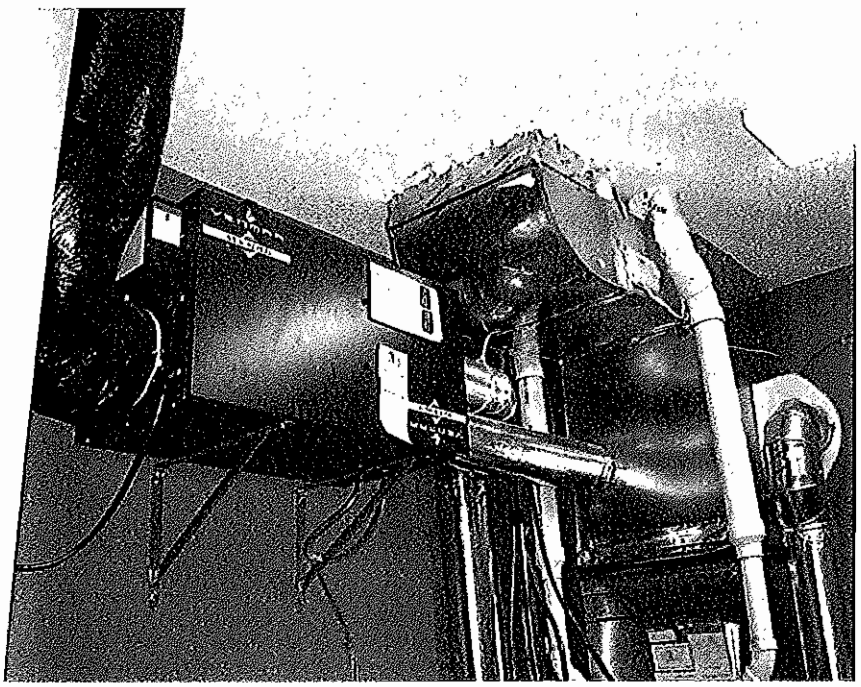
CHANGE SUMMARY: 2012 *International Residential Code* Section R303.4 mandates mechanical ventilation in any building that has less than five air changes per hour at 50 Pascals (5ACH/50). IECC Section R402.4.1.2 allows a maximum of 5 ACH/50 in any residential building. It is very unlikely that many residential buildings will have EXACTLY 5.00 ACH/50 in a testing environment. The practical outgrowth of this change is that mechanical ventilation with appropriate dampers is required in virtually every residential building.

2012 **CODE: R403.5 Mechanical Ventilation (Mandatory).** The building shall be provided with ventilation that meets the requirements of the *International Residential Code* or *International Mechanical Code*, as applicable, or with other approved means of ventilation. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

2012 International Residential Code

Section R303.4 Mechanical Ventilation. Where the air infiltration rate of a dwelling unit is less than five air changes per hour when tested with a blower door at a pressure of 0.2 inch w.c. (50 Pa) in accordance with *(IRC)* Section N1102.4.1.2, the dwelling unit shall be provided with whole-house mechanical ventilation in accordance with *(IRC)* Section M1507.3.

R403.5 continues



An air exchanger may be used to satisfy the whole house ventilation requirement

R403.5 continued

CHANGE SIGNIFICANCE: With the increased building envelope tightness requirements, the health-related ventilation provisions have been brought to the forefront. The IRC ventilation standard was developed in response to concerns of increasing levels of indoor contaminants and mold growth in residential buildings. Years of studies and input by building science experts and health professionals indicated a need for mechanical ventilation in homes to protect the health of occupants and the value of the building.

Whole-house mechanical ventilation can be accomplished using single or multiple ventilation fan(s), air exchanger(s), outdoor air duct(s) connected to return duct(s) or local exhaust(s), or a combination of these to achieve the required airflow.

In older houses with poor air sealing, the required "ventilation" *was* easily achieved through uncontrolled and random air infiltration. The difference between that uncontrolled infiltration and code-compliant controlled ventilation is similar to that between a hole broken in the side of a bathtub and a properly designed and installed overflow. In both cases, the tub will never fill above the flood level, but the end results are entirely different.

R404.1

Lighting Equipment (Mandatory)

CHANGE TYPE: Modification

CHANGE SUMMARY: There are two ways to calculate compliance: lamp count and fixture count.

The 75 percent calculation is made for all electrical lighting fixtures that are not covered by the low-voltage exception.

Both interior and exterior lighting are included.

Fuel gas systems may not have constantly burning pilot lights.

2012 CODE: R404.1 Lighting Equipment ~~(Prescriptive).~~ (Mandatory). A minimum of 75 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps or a minimum of 75 percent of the permanently installed lighting fixtures shall contain only high-efficacy lamps.

Exception: Low-voltage lighting shall not be required to utilize high-efficiency lamps.

R404.1.1 Lighting Equipment (Mandatory). Fuel gas lighting systems shall not have continuously burning pilot lights.

CHANGE SIGNIFICANCE: In 2009 IECC, this section was a Prescriptive provision; in 2012 it is Mandatory and applies to all IECC regulated residential occupancies.

Some jurisdictions have amended their adopted earlier editions of the IECC to address the "chandelier option." This is now a clearly permitted choice in the 2012 IECC. A single one-hundred-lamp fixture may be counted either as one (1) fixture or as one hundred (100) lamps as long as the unit of measure stays the same (fixtures or lamps) throughout the calculation. Please see the examples below.

The high-efficacy requirement *does not* mandate or prohibit any fixture or socket configuration. Edison-type screw base high-efficacy bulbs may be perfectly compliant.

R404.1 continues

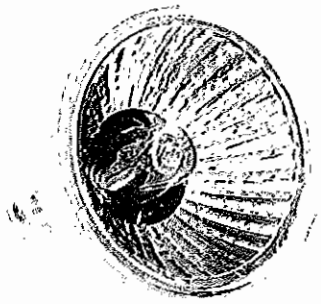
EXAMPLES:

Example 1. A new single family residence with 20 permanently installed lighting fixtures. At the time of final inspection:

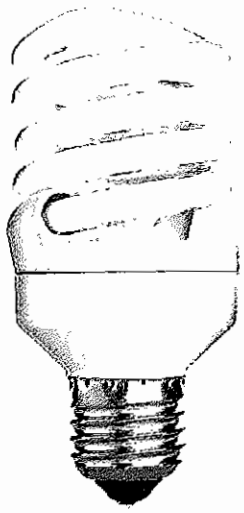
- Ten of the fixtures are low voltage, not counted.
- Eight fixtures must contain ONLY high-efficacy lamps.
- Two fixtures may contain other than high-efficacy lamps.

Example 2. A similar single family residence with 20 permanently installed lighting fixtures. At the time of final inspection:

- None of the fixtures are low voltage.
- One chandelier contains 100 high-efficacy lamps.
- Up to 75 lamps in the remaining 19 fixtures may be other than high efficacy.



This is one type of low voltage lamp. It does not contribute to the overall count.



This CFL is one type of high-efficacy lamps*

*Definition: High-efficacy lamps. Compact fluorescent lamps, T-8 or smaller diameter linear fluorescent lamps, or lamps with a minimum efficacy of:
1. 60 lumens per watt for lamps over 40 watts;
2. 50 lumens per watt for lamps over 15 watts to 40 watts; and
3. 40 lumens per watt for lamps 15 watts or less.