2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
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2012 Houston IRC – Part I—Chapters 1 & 2 Scope and Administration	2015 Houston IRC – Part I—Chapters 1 & 2 Scope and Administration	Code Analysis
Part 1—Administration (Chapters 1 and 2) ■ ***Chapter 1 Scope and Administration;*** ■ ***Chapter 2 Definitions*** The administration part of the *International Residential Code* (IRC) covers the general scope, purpose, applicability, and other administrative issues related to the regulation of residential buildings by building safety departments. The administrative provisions establish the responsibilities and duties of the various parties involved in residential construction and the applicability of the technical provisions within a legal, regulatory, and code-enforcement arena. Section R101.2 establishes the criteria for buildings that are regulated by the IRC. Buildings beyond the scope of Section R101.2 are regulated by the *International Building Code* (IBC). The remaining topics in the administration provisions of Chapter 1 include the establishment of the building safety department, duties of the building official, permits, construction documents, and inspections. The definitions contained within the IRC are intended to reflect the special meaning of such terms within the scope of the code. As terms can often have multiple meanings within their ordinary day-to-day use or within the various disciplines of the construction industry, it is important that their meanings within the context of the IRC be understood. Most definitions used throughout the IRC are found in Chapter 2, but additional definitions specific to the applicable topics are found in the energy provisions of Chapter 11, the fuel gas provisions of Chapter 24, and the electrical provisions of Chapter 35. **R101.2, R202**-Scope—Accessory Structures; **R104.11**-Alternative Materials, Design, and Methods of Construction and Equipment; **R105.3.1.1**-Existing Buildings in Flood Hazard Areas; **R106.1.4**-Information for Construction in Flood Hazard Areas		
R101.1 Title. These provisions shall be known as the *City of Houston Residential Code* ~~*for One- and Two-family Dwellings* of [NAME OF JURISDICTION]~~ and shall be cited as such and will be referred to herein as "this code". The *City of Houston Construction Code* collectively includes this volume and certain other codes, pamphlets, specifications, and documents that are adopted in or by reference through the adopting ordinance, City of Houston Ordinance No. 2015-1108.	**R101.1 Title.** These provisions shall be known as the *City of Houston Residential Code*, ~~*for One- and Two-family Dwellings* of [NAME OF JURISDICTION] and shall be cited as such and will be referred to~~ herein after referred to as "this code~~.~~" and also known as the *Residential Code*. The *City of Houston Construction Code* collectively includes this volume and certain other codes, pamphlets, specifications, and documents that are adopted in or by reference through the adopting ordinance, City of Houston Ordinance No. 2021-1037.[4]	***City of Houston Amendment*** **Analysis:** The previous COH amendment was modified by City legal. ***No change to the technical code requirements or code intent.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed and edited by the *City Legal Department*.
R101.2 Scope. The provisions of ~~the *International Residential Code for One- and Two-family Dwellings*~~ this code shall apply to the construction, *alteration,* movement, enlargement, replacement, repair, equipment, use and occupancy, location, removal, and demolition of detached one- and two-family dwellings and townhouses not more than three stories above *grade plane* in height with a separate means of egress and their *accessory structures.* Buildings that exceed three stories in height shall comply with the *Building Code*, *Electrical Code*, *Mechanical Code*, *Plumbing Code*, and *International Energy Conservation Code*. One- and two-family dwellings and townhouses shall be classified as Group R-3 occupancies, and accessory structures shall be classified as Group U occupancies. **Exceptions:** 1. Live/work units complying with the requirements of Section 419 of the ~~*International*~~ *Building Code* shall be permitted to be built as one- and two-family *dwellings* or townhouses. Fire suppression required by Section 419.5 of the ~~*International*~~ *Building Code* when constructed under this code ~~the *International Residential Code for One- and Two-family Dwellings*~~ shall conform to Section P2904. 2. Owner-occupied lodging houses with five or fewer guestrooms shall be permitted to be constructed in accordance with this code ~~the *International Residential Code for One- and Two-family Dwellings*~~ when equipped with a fire sprinkler system in accordance with Section P2904.	**R101.2 Scope.** The provisions of ~~the *International Residential Code for One- and Two-Family Dwellings*~~ this code shall set forth ~~apply the~~ minimum requirements and standards applicable to the construction, *alteration*, movement, enlargement, replacement, repair, *equipment*, use and occupancy, location, removal and demolition, disassembly and reuse of materials associated with ~~of~~ detached one- and two-family dwellings and *townhouses* not more than three stories above *grade plane* in height with a separate means of egress system and their *accessory structures* ~~.~~ not more than three stories above *grade plane* in height. Buildings, systems, and other construction not specifically defined or addressed in this code shall comply with all applicable provisions of the *Construction Code*. One- and two-family dwellings and *townhouses* shall be classified as Group R-3 occupancies, and accessory structures shall be classified as Group U occupancies. **Exceptions:** 1. Live/work units located in *townhouses* and complying with the requirements of Section 419 of the ~~*International Building Code*~~ shall be permitted to be constructed in accordance with ~~the *International Residential Code for One- and Two-Family Dwellings*~~ this code. Fire suppression required by Section 419.5 of the ~~*International Building Code*~~ where constructed under this code ~~the *International Residential Code for One- and Two-family Dwellings*~~ shall conform to Section P2904. 2. Owner-occupied lodging houses with five or fewer guestrooms shall be permitted to be constructed in accordance with this code ~~the *International Residential Code for One- and Two-family Dwellings*~~ where equipped with a fire sprinkler system in accordance with Section P2904.	***City of Houston Amendment*** **Analysis:** The previous COH amendment is modified to include minor editorial changes. Additional changes coordinate with changes made in other sections that address height limits of accessory structures. *Change to the technical code requirements of this section include the elimination of accessory building area limits.* *CHANGE SIGNIFICANCE: In previous editions of the IRC, the definition in Section R202 placed limitations of 3,000 square feet in area and two stories on accessory structures. The 3,000-square-foot limitation was introduced in the 2006 IRC based on a concern of the potential fire load in residential accessory buildings. The area limitation has been removed from the 2015 IRC based on the residential setting of these buildings, the need for larger accessory buildings in rural areas, and the fact that dwellings and townhomes constructed under the IRC are unlimited in area. The change also recognizes that zoning regulations typically set limits for area and height of accessory buildings based on the density of housing and other factors unique to the individual jurisdiction. It was judged more appropriate to allow jurisdictions to decide what limits are placed on accessory buildings. For example, in rural areas with large lots and acreages, very large accessory buildings are routinely constructed for vehicle and farm equipment storage and to house hobby shops and workshops. In addition, definitions are not intended to contain technical requirements such as area and height limitations, which should be addressed in the applicable sections in the body of the code. The definition maintains the key elements for permitting accessory buildings to be constructed under the IRC—that they must be accessory to and incidental to that of the dwelling and located on the same lot as the dwelling.* *The height limitation for accessory buildings has also been removed from the definition and placed in the scoping provisions of the IRC. The maximum height has increased to three stories above grade plane for consistency with the height limitations for dwellings and townhomes.* **Justification:** • Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City

[4] City Secretary shall insert number of adopting ordinance.

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		Legal Department. • Building Code Action Committee (BCAC) decided that specifying a limitation on the size of the accessory structure **should be a decision left to the building official**. • Accessory Structure Definition has been changed to delete area limitations.
R102.1 General. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall be applicable. Where, in any specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive shall govern.	**R102.1 General.** Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall prevail ~~be applicable~~. Where~~,~~ in any specific instance ~~case, different sections of~~ provisions of this code, including adopted appendices, specify different materials, different methods of construction or other requirements that differ from those provided in the *City Code* or other volumes of the *Construction Code*, including adopted appendices, other than the *Fire Code* and its adopted appendices and standards, the most restrictive shall prevail ~~govern~~. Where, in any specific instance, provisions of this code, including adopted appendices, specify different materials, different methods of construction, or other requirements that differ from those provided in the *Fire Code*, including its adopted appendices and standards, and the *building official* and the fire marshal are unable to mutually reconcile the requirements by issuing a written interpretation, then either of them may refer the matter to the General Appeals Board created under the *Building Code*, which shall conduct a review of the matter and issue a written code interpretation based upon the apparent intent of the codes involved. Notwithstanding any other provision, interpretations that are issued by the General Appeals Board shall not be subject to further appeal.	***City of Houston Amendment*** **Analysis:** New amendment has been added for clarification. **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R102.5 Appendices. Provisions in the appendices shall not apply unless specifically referenced in ~~the adopting ordinance~~ this section. Appendices A, B, C, H, L, M and V are hereby adopted and made part of this code.	**R102.5 Appendices.** Provisions in the appendices shall not apply unless specifically referenced in ~~the adopting ordinance~~ this section. Appendices A, B, C, H, K, L, M, Q, T, U, and V are hereby adopted and made part of this code.	***City of Houston Amendment*** **Analysis:** The existing amendment was modified to include Appendices "**K=**Sound Transmission for IRC Townhouses Only, **M=**Home Daycare (HFD), **Q=**Airport Sound Attenuation, **T=**Tiny Houses, and **U=**Solar Ready to correlate with the IECC" to the 2015 Amendments. **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R102.7 Existing structures. The legal occupancy of any structure existing on the date of adoption of this code shall be permitted to continue without change, except as is ~~specifically covered in this code, the *International Property Maintenance Code*, or the *International Fire Code*, or as is~~ deemed necessary by the *building official* for the general safety and welfare of the occupants and the public.	**R102.7 Existing structures.** The legal occupancy of any structure existing on the date of adoption of this code shall be permitted to continue without change, except as is ~~specifically covered in this code, the *International Property Maintenance Code*, or the *International Fire Code*, or as is~~ deemed necessary by the *building official* for the general safety and welfare of the occupants and the public.	***City of Houston Amendment*** **Analysis:** No changes were made to the previous COH amendment. ***No change to the technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R102.8 Special piping and storage systems. See the *International Fire Code* regarding flammable and combustible liquids.	**R102.8 Special piping and storage systems.** See Chapter 57 of the *Fire Code* regarding flammable and combustible liquids.	***City of Houston Amendment*** **Analysis:** The existing amendment was modified to include the specific chapter for flammable and combustible liquids in the Fire

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		Code. ***No change to the technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R102.9 *Electrical Code*. Part VIII—Electrical (Chapters 34-43) of this code is not adopted. All electrical work and licensing shall comply with the *Electrical Code*. All references made to the *Electrical Code* are to be considered as made to the *City of Houston Electrical Code*.	**R102.9 Electrical Code.** Part VIII-Electrical (Chapters 34-43) of the 2015 *International Residential Code* is not adopted. All electrical work and licensing shall comply with the *Electrical Code.*	***City of Houston Amendment*** **Analysis:** The previous COH amendment was modified for clarity. ***No change to the technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R102.10 *Mechanical Code*. The licensing of air-conditioning contractors shall be as required by the *Mechanical Code* and applicable State laws. This code includes numerous references to the *International Mechanical Code*. For the sake of convenience and cost savings to the public in the preparation of Houston Supplement pages to this code, those references have not been revised unless the text of the provision in which they appear has otherwise been revised by this jurisdiction. Any such references shall be regarded as references to the corresponding code as adopted by this jurisdiction from time to time. This jurisdiction reserves the right to adopt codes based upon promulgations of organizations other than the International Code Council, including but not limited to the Uniform Series Codes, to the extent permitted by State law. Any reference to a specific chapter, section, or provision of a code that has not been adopted by this jurisdiction shall be construed to mean the corresponding provision of the corresponding code as adopted by this jurisdiction.	**R102.10 Mechanical Code.** The licensing of air-conditioning contractors shall be as required by the *Mechanical Code* and applicable State laws. This code includes numerous references to the *International Mechanical Code.* For the sake of convenience and cost savings to the public in the preparation of Houston Supplement pages to this code, those references have not been revised unless the text of the provision in which they appear has otherwise been revised by this *jurisdiction*. Any such references shall be regarded as references to the corresponding code as adopted by this *jurisdiction* from time to time. The *jurisdiction* reserves the right to adopt codes based upon promulgations of organizations other than the International Code Council, including, but not limited to, the Uniform Series Codes, to the extent permitted by State law. Any reference to a specific chapter, section, or provision of a code that has not been adopted by this *jurisdiction* shall be construed to mean the corresponding provision of the corresponding code as adopted by this *jurisdiction*.	***City of Houston Amendment*** **Analysis:** No changes were made to COH amendment. ***No change to the technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R102.11 *Plumbing Code*. The licensing of plumbers and plumbing contractors shall be as required in the *Plumbing Code* and applicable State laws. This code includes numerous references to the *International Plumbing Code*. For the sake of convenience and cost savings to the public in the preparation of Houston Supplement pages to this code, those references have not been revised unless the text of the provision in which they appear has otherwise been revised by this jurisdiction. Any such references shall be regarded as references to the corresponding code as adopted by this jurisdiction from time to time. This jurisdiction reserves the right to adopt codes based upon promulgations of organizations other than the International Code Council, including but not limited to the Uniform Series Codes, to the extent permitted by State law. Any reference to a specific chapter, section, or provision of a code that has not been adopted by this jurisdiction shall be construed to mean the corresponding provision of the corresponding code as adopted by this jurisdiction.	**R102.11 Plumbing Code.** The licensing of plumbers and plumbing contractors shall be as required in the *Plumbing Code* and applicable State laws. This code includes numerous references to the *International Plumbing Code*. For the sake of convenience and cost savings to the public in the preparation of Houston Supplement pages to this code, those references have not been revised unless the text of the provision in which they appear has otherwise been revised by this *jurisdiction*. Any such references shall be regarded as references to the corresponding code as adopted by this *jurisdiction* from time to time. This *jurisdiction* reserves the right to adopt codes based upon promulgations of organizations other than the International Code Council, including but not limited to the Uniform Series Codes, to the extent permitted by State law. Any reference to a specific chapter, section, or provision of a code that has not been adopted by this *jurisdiction* shall be construed to mean the corresponding provision of the corresponding code as adopted by this *jurisdiction*.	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
SECTION R103 **~~DEPARTMENT OF BUILDING SAFETY~~** **BUILDING CODE ENFORCEMENT** **R103.1 Creation of enforcement agency.** The Building Code Enforcement Division ~~department of building~~ safety is hereby created within the jurisdiction's Department of Public Works and Engineering, and the official in charge thereof shall be known as the *building official.*	**SECTION R103** **~~DEPARTMENT OF BUILDING SAFETY~~** **BUILDING CODE ENFORCEMENT** **R103.1 Creation of enforcement agency.** The Building Code Enforcement Division ~~department of building safety~~ is hereby created within the *jurisdiction's* department known as Houston Public Works, and the official in charge thereof shall be known as the *building official.*	***City of Houston Amendment*** **Analysis:** The existing amendment was modified. ***No change to the technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R104.2 Applications and permits. The *building official* shall receive applications, review *construction documents* and issue permits for the erection and alteration of	**R104.2 Applications and permits.** The building official shall receive applications, review construction documents and issue permits for the erection and alteration of buildings and structures, inspect the premises for which such permits have been issued	***City of Houston Amendment*** **Analysis:** New amendment has been added. ***No change to the technical code requirements or code intent of this section.***

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buildings and structures, inspect the premises for which such permits have been issued and enforce compliance with the provisions of this code.	and enforce compliance with the provisions of this code as identified in the *Building Code*.	**Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R104.8 Liability. ~~The *building official*, member of the board of appeals or employee charged with the enforcement of this code, while acting for the *jurisdiction* in good faith and without malice in the discharge of the duties required by this code or other pertinent law or ordinance, shall not thereby be rendered liable personally and is hereby relieved from personal liability for any damage accruing to persons or property as a result of any act or by reason of an act or omission in the discharge of official duties. Any suit instituted against an officer or employee because of an act performed by that officer or employee in the lawful discharge of duties and under the provisions of this code shall be defended by legal representative of the *jurisdiction* until the final termination of the proceedings. The *building official* or any subordinate shall not be liable for cost in any action, suit or proceeding that is instituted in pursuance of the provisions of this code.~~ Except as otherwise provided by law, the *building official* shall not personally be liable in damages for any act or omission arising out of any official action taken to implement and enforce the provisions of this code. Additionally, except as otherwise provided by law, the *building official* shall not personally be liable in damages for any action or omission taken in the course and scope of employment. Where and to the extent consistent with the provisions of Chapter 2, Article X, of the *City Code*, the jurisdiction shall provide legal representation and indemnification for any suit brought against the *building official* because of acts or omissions performed in the enforcement of this code. This code shall not be construed to relieve from or lessen the responsibility of any person owning, operating, or controlling any building or structure for any damages to persons or property caused by defects, nor shall the code enforcement agency or its parent jurisdiction be held as assuming any such liability by reason of the inspections authorized by this code or any *permits* or certificates issued under this code.	**R104.8 Liability.** ~~The *building official*, member of the board of appeals or employee charged with the enforcement of this code, while acting for the *jurisdiction* in good faith and without malice in the discharge of the duties required by this code or other pertinent law or ordinance, shall not thereby be rendered civilly or criminally liable personally and is hereby relieved from personal liability for any damage accruing to persons or property as a result of any act or by reason of an act or omission in the discharge of official duties.~~ Except as otherwise provided by law, the *building official* shall not personally be liable in damages for any act or omission arising out of any official action taken to implement and enforce the provisions of this code. Additionally, except as otherwise provided by law, the *building official* shall not personally be liable in damages for any act or omission taken in the course and scope of employment. Where and to the extent consistent with the provisions of Chapter 2, Article X, of the *City Code*, this *jurisdiction* shall provide legal representation and indemnification for any suit or claim brought against the *building official* or any deputies because of acts or omissions performed in the implementation or enforcement of this code. This code shall not be construed to relieve from or lessen the responsibility of any person owning, operating, or controlling any building, structure or system or other construction for any damages to persons or property caused by defects, nor shall the code enforcement agency or the *jurisdiction* be held as assuming any such liability by reason of the inspections authorized by this code or any permits or certificates issued under this code.	***City of Houston Amendment*** **Analysis:** The previous COH amendment was modified to include minor editorial changes. ***No change to the technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
N/A	**~~R104.8.1 Legal defense.~~** ~~Any suit or criminal complaint instituted against an officer or employee because of an act performed by that officer or employee in the lawful discharge of duties and under the provisions of this code shall be defended by legal representatives of the *jurisdiction* until the final termination of the proceedings. The *building official* or any subordinate shall not be liable for cost in any action, suit or proceeding that is instituted in pursuance of the provisions of this code.~~	***City of Houston Amendment*** **Analysis:** A COH amendment was added by the legal department to delete this new code provision in the model code. **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R104.10 Modifications. Wherever there are practical difficulties involved in carrying out the provisions of this code, the *building official* shall have the authority to grant modifications for individual cases, provided the *building official* shall first find that special individual reason makes the strict letter of this code impractical, and the modification is in compliance with the intent and purpose of this code and that such modification does not lessen health, life and fire safety or structural requirements. The details of action granting modifications shall be recorded and entered in the files of the department of building safety.	**R104.10 Modifications.** Where there are practical difficulties involved in carrying out the provisions of this code, the *building official* shall have the authority to grant modifications for individual cases, provided the *building official* shall first find that special individual reason makes the strict letter of this code impractical, and the modification is in compliance with the intent and purpose of this code and that such modification does not lessen health, life and fire safety or structural requirements. The details of action granting modifications shall be recorded and entered in the files of Building Code Enforcement ~~the department of building safety~~.	***City of Houston Amendment*** **Analysis:** A COH amendment was added by legal to include the name of the *Building Code Enforcement* branch of Houston Public Works for clarity. ***No change to the technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
{EDITOR'S NOTE: DELETE SECTION R104.10.1 IN ITS ENTIRETY.} **~~R104.10.1 Flood hazard areas.~~** ~~The *building official* shall not grant modifications to any provision related to flood hazard areas as established by Table R301.2(1) without the granting of a variance to such provisions by the board of appeals.~~	**{EDITORIAL NOTE: DELETE SECTION R104.10.1 IN ITS ENTIRETY.}** **~~R104.10.1 Flood hazard areas.~~** ~~The *building official* shall not grant modifications to any provisions required in flood hazard areas as established by Table R301.2(1) unless a determination has been made that:~~	***City of Houston Amendment*** **Analysis:** The model code was expanded extensively to identify specific justifications for granting a requested modification to the prescriptive code requirements. However, no changes were made to the COH amendment which deletes this section in its entirety. **~~R104.10.1~~** ***No change to the technical code requirements or code intent of this section.***

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	~~**1.** There is good and sufficient cause showing that the unique characteristics of the size, configuration or topography of the site render the elevation standards of Section R322 inappropriate.~~ ~~**2.** Failure to grant the modification would result in exceptional hardship by rendering the lot undevelopable.~~ ~~**3.** The granting of modification will not result in increased flood heights, additional threats to public safety, extraordinary public expense, cause fraud on or victimization of the public, or conflict with existing laws or ordinances.~~ ~~**4.** The modification is the minimum necessary to afford relief, considering the flood hazard.~~ ~~**5.** Written notice specifying the difference between the design flood elevation and the elevation to which the building is to be built, stating that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced floor elevation and stating that construction below the design flood elevation increases risks to life and property, has been submitted to the applicant.~~	**Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R104.11 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been *approved.* An alternative material, design or method of construction shall be *approved* where the *building official* finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method, or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code. ~~Compliance with the specific performance-based provisions of the International Codes in lieu of specific requirements of this code shall also be permitted as an alternate.~~	**R104.11 Alternative materials, design and methods of construction and equipment.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method, or work offered is, for the purpose intended, ~~at least~~ not less than the equivalent of that prescribed in this code. Compliance with the specific performance-based provisions of the International Codes ~~in lieu of~~ shall be an alternative to the specific requirements of this code. Where the alternative material, design or method of construction is not approved, the building official shall ~~also be permitted as an alternate.~~ respond in writing, stating the reasons why the alternative was not approved.	***City of Houston Amendment*** **Analysis:** The previous COH amendment was omitted in favor of the model code and its updated code provisions. ***No change to the technical code requirements or code intent of this section.*** ***CHANGE SIGNIFICANCE:*** *When a building official denies a proposal for using an alternative material, design or method of construction, the reason for denial must be provided in writing to the applicant. This new requirement mirrors the permit application provisions in Section R105.3.1, which require the building official to state in writing the reasons for rejection of a permit application. This change assumes reasons for responding to the applicant in writing are to ensure effective communication and due process of law. The applicant, using a written denial, may determine whether to modify the product or design, substitute a new product or method of construction, or correct errors in application of the alternate. The new language is added to all the International Codes for consistency of application.* **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R104.12 Stop orders. The *building official* may order work stopped hereunder in the same manner provided in Section 115 of the *Building Code*.	**R104.12 Stop orders.** The *building official* may order work stopped hereunder in the same manner provided in Section 115 of the *Building Code.*	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R105.2 Work exempt from permit. *Permits* shall not be required for the following. Exemption from *permit* requirements of this code shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other laws or ordinances of this *jurisdiction.* **Building:** **1.** One-story detached *accessory structures* used as tool and storage sheds, playhouses, and similar uses, provided the floor area does not exceed 200 square feet (18.58 m^2). **2.** Fences not over ~~7~~ 8 feet (~~2134~~ 2,438 mm) high that are not constructed of masonry or concrete.	**R105.2 Work exempt from permit.** Exemption from *permit* requirements of this code shall not be deemed to grant exemption from permits required by other codes or ordinances and shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other codes, laws, or ordinances of this *jurisdiction. Permits* shall not be required for the following: **Building:** **1.** One-*story* detached *accessory structures*, ~~used as tool and storage sheds, playhouses and similar uses,~~ provided that the floor area does not exceed ~~200~~ 120 square feet (~~18.58~~ 11.15 m^2).	***City of Houston Amendment*** **Analysis:** The existing amendment was modified to coincide with the provisions of the Building Code for accessory structures and now includes the following additional changes: **1.** A change now requires a permit for electric fences for a field inspection for compliance with the requirements specified in the *City Code*. **2.** A COH change now identifies specific minor repairs that are exempt from obtaining a building permit.

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3. Retaining walls that are not over 4 feet (1,219 mm) in height measured from the bottom of the footing to the top of the wall, unless supporting a surcharge. **4.** Water tanks supported directly upon *grade* if the capacity does not exceed 5,000 gallons (18,927 L) and the ratio of height to diameter or width does not exceed 2 to 1. **5.** ~~Sidewalks and driveways.~~ Uncovered wood decks, accessory to a one- or two-family dwelling, that are not more than 30 inches above grade. **6.** Painting, papering, tiling, carpeting, cabinets, counter tops and similar finish work including the repair of damaged gypsum board that is not part of a fire-rated assembly. **7.** Prefabricated swimming pools accessory to a one- or two-family dwelling in which the pool walls are entirely above grade, and the pool capacity does not exceed 5,000 gallons (18,927 L) ~~that are less than 24 inches (610 mm) deep~~. **8.** Swings and other playground equipment. **9.** Window awnings supported by an exterior wall which do not project more than 54 inches (1,372 mm) from the exterior wall and do not require additional support. **10.** Decks not exceeding 200 square feet (18.58 m^2) in area, that are not more than 30 inches (762 mm) above *grade* at any point, are not attached to a *dwelling* and do not serve the exit door required by Section R311.4. **11.** Repair of exterior wood facia, trim, and soffits, as well as siding that does not exceed 128 square feet and is not part of a fire-rated assembly. **12.** Roof covering that does not exceed 100 square feet. **Electrical:** **1.** *Listed* cord-and-plug connected temporary decorative lighting. **2.** Reinstallation of attachment plug receptacles but not the outlets therefor. **3.** Replacement of branch circuit overcurrent devices of the required capacity in the same location. **4.** Electrical wiring, devices, *appliances,* apparatus, or *equipment* operating at less than 25 volts and not capable of supplying more than 50 watts of energy. **5.** ~~Minor repair work, including t~~The replacement of lamps or the connection of *approved* portable electrical *equipment* to *approved* permanently installed receptacles. **Gas:** **1.** Portable heating, cooking or clothes drying *appliances.* **2.** Replacement of any minor part that does not alter approval of *equipment* or make such *equipment* unsafe. **3.** Portable-fuel-cell *appliances* that are not connected to a fixed piping system and are not interconnected to a power grid. **Mechanical:** **1.** Portable heating *appliances.* **2.** Portable ventilation *appliances.* **3.** Portable cooling units. **4.** Steam, hot- or chilled-water piping within any heating or cooling *equipment* regulated by this code. **5.** Replacement of any minor part that does not alter approval of *equipment* or make such *equipment* unsafe. **6.** Portable evaporative coolers. **7.** Self-contained refrigeration systems containing 10 pounds (4.54 kg) or less of refrigerant or that are actuated by motors of 1 horsepower (7 46 W) or less.	**2.** Fences not over ~~7~~ 8 feet (~~2,134~~ 2,438 mm) high that are not constructed of masonry or concrete, and that are not electrically energized. **3.** Retaining walls that are not over 4 feet (1,219 mm) in height measured from the bottom of the footing to the top of the wall, unless supporting a surcharge. **4.** Water tanks supported directly upon *grade* if the capacity does not exceed 5,000 gallons (18,927 L) and the ratio of height to diameter or width does not exceed 2 to 1. **5.** ~~Sidewalks and driveways.~~ Uncovered wood decks accessory to a one- and two-family dwelling that are not more than 30 inches above *grade*. **6.** Minor repair and maintenance of existing structures that include: **6.1.** Painting, tarping, wallpapering, tiling, carpeting, cabinets~~,~~ and counter tops repair and replacement and similar finish work. **6.2.** Repair to gypsum board (sheetrock or drywall) on existing walls that is not part of a fire-rated assembly and that does not exceed an aggregate of 100 square feet (9.29 m^2). **6.3.** Repair, using the same material, of exterior wood fascia, trim and soffits that do not exceed an aggregate of 128 square feet (11.89 m^2); or **6.4.** Roof covering that does not exceed an aggregate of 100 square feet (9.29 m^2). ~~**7.** Prefabricated *swimming pools* that are less than 24 inches (610 mm) deep.~~ **78.** Minor single-family residential accessory ~~S~~swings and other residential playground equipment less than 12-feet in height. **89.** Window awnings supported by an exterior wall which ~~that~~ do not project more than 54 inches (1,372 mm) from the exterior wall and do not require additional support. **9~~10~~.** Decks not exceeding 200 square feet (18.58 m^2) in area, that are not more than 30 inches (762 mm) above *grade* at any point, are not attached to a *dwelling* and do not serve the exit door required by Section R311.4. **Electrical:** **1.** *Listed* cord-and-plug connected temporary decorative lighting. **2.** Reinstallation of attachment plug receptacles but not the outlets therefor. **3.** Replacement of branch circuit overcurrent devices of the required capacity in the same location. **4.** Electrical wiring, devices, *appliances*, apparatus, or *equipment* operating at less than 25 volts and not capable of supplying more than 50 watts of energy. **5.** ~~Minor *repair* work, including the~~ The replacement of lamps or the connection of *approved* portable electrical *equipment* to *approved* permanently installed receptacles. **Gas:** **1.** Portable heating, cooking or clothes drying *appliances.* **2.** Replacement of any minor part that does not alter approval of *equipment* or make such *equipment* unsafe. **3.** Portable-fuel-cell *appliances* that are not connected to a fixed piping system and are not interconnected to a power grid. **Mechanical:** **1.** Portable heating *appliances.* **2.** Portable ventilation *appliances.* **3.** Portable cooling units.	**3.** A change eliminates the permit exemption for prefab swimming pools less than 24-inches in depth due to the requirements of the Health Department and the state minimum and city adopted 2018 ISPSC. **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.

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8. Portable-fuel-cell *appliances* that are not connected to a fixed piping system and are not interconnected to a power grid. **Plumbing:** **1.** The stopping of leaks in drains, water, soil, waste, or vent pipe; provided, however, that if any concealed trap, drainpipe, water, soil, waste, or vent pipe becomes defective and it becomes necessary to remove and replace the same with new material, such work shall be considered as new work and a *permit* shall be obtained and inspection made as provided in this code. **2.** The clearing of stoppages or the repairing of leaks in pipes, valves or fixtures, and the removal and reinstallation of water closets, provided such repairs do not involve or require the replacement or rearrangement of valves, pipes, or fixtures.	**4.** Steam, hot- or chilled-water piping within any heating or cooling *equipment* regulated by this code. **5.** Replacement of any minor part that does not alter approval of *equipment* or make such *equipment* unsafe. **6.** Portable evaporative coolers. **7.** Self-contained refrigeration systems containing 10 pounds (4.54 kg) or less of refrigerant or that are actuated by motors of 1 horsepower (746 W) or less. **8.** Portable-fuel-cell *appliances* that are not connected to a fixed piping system and are not interconnected to a power grid. **Plumbing:** **1.** The stopping of leaks in drains, water, soil, waste, or vent pipe; provided, however, that if any concealed trap, drainpipe, water, soil, waste, or vent pipe becomes defective and it becomes necessary to remove and replace the same with new material, such work shall be considered as new work and a *permit* shall be obtained and inspection made as provided in this code. **2.** The clearing of stoppages or the repairing of leaks in pipes, valves or fixtures, and the removal and reinstallation of water closets, provided such repairs do not involve or require the replacement or rearrangement of valves, pipes, or fixtures.	
R105.2.1 Emergency repairs. Where *equipment* replacements and repairs must be performed in an emergency situation, the *permit* application shall be submitted within the next working business day to the *building official*.	**R105.2.1 Emergency replacements or *repairs*.** Where emergency *equipment* replacements ~~and~~ or emergency repairs ~~for which a permit is required~~ must be performed, the *permit* application shall be submitted to the building official ~~within~~ not later than the next ~~working~~ business day after initiation of the replacement or repair.	***City of Houston Amendment*** **Analysis:** A COH amendment is added to clarify the time allowed to obtain a permit for emergency repairs. ***No change to the previous COH policy and practice.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R105.2.2 Repairs. Application or notice to the *building official* is not required for ordinary repairs to structures, replacement of lamps or the connection of *approved* portable electrical *equipment* to *approved* permanently installed receptacles. Such repairs shall not include the cutting away of any wall, partition or portion thereof, the removal or cutting of any structural beam or load-bearing support, or the removal or change of any required means of egress, or rearrangement of parts of a structure affecting the egress requirements; nor shall ordinary repairs include *addition* to, *alteration* of, replacement or relocation of any water supply, sewer, drainage, drain leader, gas, soil, waste, vent or similar piping, electric wiring or mechanical or other work affecting public health or general safety.	**R105.2.2 Repairs.** Application or notice to the *building official* is not required for ordinary repairs to structures or any item listed in Section 105.2. Such repairs shall not include the cutting away of any wall, partition or portion thereof, the removal or cutting of any structural beam or load-bearing support, or the removal or change of any required means of egress system, or rearrangement of parts of a structure affecting the egress requirements; nor shall ordinary repairs include *addition* to, *alteration* of, replacement or relocation of any water supply, sewer, drainage, drain leader, gas, soil, waste, vent or similar piping, electric wiring or mechanical or other work affecting public health or general safety.	***City of Houston Amendment*** **Analysis:** A COH amendment added by legal for additional clarity. ***No change to the technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R105.3 Application for permit. To obtain a *permit*, the applicant shall first file an application therefor in writing on a form furnished by the department of building safety for that purpose. Such application shall: **1.** Identify and describe the work to be covered by the *permit* for which application is made. **2.** Describe the land on which the proposed work is to be done by legal description, street address or similar description that will readily identify and definitely locate the proposed building or work. **3.** Indicate the use and occupancy for which the proposed work is intended. **4.** Be accompanied by *construction documents* and other information as required in Section R106.1. **5.** State the valuation of the proposed work. **6.** Be signed by the applicant or the applicant's authorized agent.	**R105.3 Application for permit.** To obtain a *permit*, the applicant shall first file an application therefor in writing on a form furnished by Building Code Enforcement ~~the department of building safety~~ for that purpose. Such application shall: **1.** Identify and describe the work to be covered by the *permit* for which application is made. **2.** Describe the land on which the proposed work is to be done by legal description, street address or similar description that will readily identify and definitely locate the proposed building or work. **3.** Indicate the use and occupancy for which the proposed work is intended. **4.** Be accompanied by *construction documents* and other information as required in Section R106.1. **5.** State the ~~valuation of~~ total aggregate square footage of any new structure, addition(s), alteration, and the square footage of new paving, and linear feet of	***City of Houston Amendment*** **Analysis:** A COH amendment was added to clarify that the square footage associated with all new construction and remodel alterations must be included with every permit application. **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.

7. Give such other data and information as required by the *building official*.	new sidewalks and curbs located within the right-of-way associated with the proposed work. **6.** Be signed by the applicant or the applicant's authorized agent. **7.** Give such other data and information as required by the *building official*.	
{**EDITOR'S NOTE:** **DELETE** SECTION R105.3.1.1 IN ITS ENTIRETY.} ~~**R105.3.1.1 Determination of substantially improved or substantially damaged existing buildings in flood hazard areas.** For applications for reconstruction, rehabilitation, *addition* or other improvement of existing buildings or structures located in a flood hazard area as established by Table R301.2(1), the *building official* shall examine or cause to be examined the *construction documents* and shall prepare a finding with regard to the value of the proposed work. For buildings that have sustained damage of any origin, the value of the proposed work shall include the cost to repair the building or structure to its predamaged condition. If the *building official* finds that the value of proposed work equals or exceeds 50 percent of the market value of the building or structure before the damage has occurred or the improvement is started, the finding shall be provided to the board of appeals for a determination of substantial improvement or substantial damage. Applications determined by the board of appeals to constitute substantial improvement or substantial damage shall require all existing portions of the entire building or structure to meet the requirements of Section R322.~~	{**EDITORIAL NOTE:** DELETE SECTION R105.3.1.1 IN ITS ENTIRETY AND RESERVE.} ~~**R105.3.1.1 Determination of substantially improved or substantially damaged existing buildings in flood hazard areas.** For applications for reconstruction, rehabilitation, *addition,* alteration, repair or other improvement of existing buildings or structures located in a flood hazard area as established by Table R301.2(1), the *building official* shall examine or cause to be examined the *construction documents* and shall make a determination with regard to the value of the proposed work. For buildings that have sustained damage of any origin, the value of the proposed work shall include the cost to repair the building or structure to its predamaged condition. If the *building official* finds that the value of proposed work equals or exceeds 50 percent of the market value of the building or structure before the damage has occurred or the improvement is started, the proposed work is a substantial improvement or restoration of substantial damage and the building official shall require existing portions of the entire building or structure to meet the requirements of Section R322.~~ ~~For the purpose of this determination, a substantial improvement shall mean any repair, reconstruction, rehabilitation, addition or improvement of a building or structure, the cost of which equals or exceeds 50 percent of the market value of the building or structure before the improvement or repair is started. Where the building or structure has sustained substantial damage, repairs necessary to restore the building or structure to its predamaged condition shall be considered substantial improvements regardless of the actual repair work performed. The term shall not include either of the following:~~ ~~**1.** Improvements to a building or structure that are required to correct existing health, sanitary or safety code violations identified by the building official and that are the minimum necessary to ensure safe living conditions.~~ ~~**2.** Any alteration of a historic building or structure, provided that the alteration will not preclude the continued designation as a historic building or structure. For the purposes of this exclusion, a historic building shall be any of the following:~~ ~~**2.1.** Listed or preliminarily determined to be eligible for listing in the National Register of Historic Places.~~ ~~**2.2.** Determined by the Secretary of the U.S. Department of Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined to qualify as an historic district.~~ ~~**2.3.** Designated as historic under a state or local historic preservation program that is approved by the Department of Interior.~~	***City of Houston Amendment*** **Analysis:** The previous COH amendment was modified. ***No change to the technical code requirements or code intent of this section.*** *CHANGE SIGNIFICANCE: The criteria used to determine substantial improvement or substantial damage for existing buildings in flood hazard areas has been moved from the Building Board of Appeals provisions in Section R112.2.1 to Section R105.3.1.1 related to the building official's action on a permit application. The language requiring the Building Board of Appeals to decide of substantial improvement in flood hazard areas has been removed from Section R112.2. In effect, this determination is now a one-step process rather than a two-step process. It relies on the building official to determine whether work on existing buildings in flood hazard areas meets the definitions for "substantial improvement" and "substantial damage," rather than having the building official make a finding and then having the Board of Appeals decide based on that finding.* **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R105.3.2 Time limitation of application. An application for a *permit* for any proposed work shall be deemed to have been abandoned 180 days after the date of filing unless such application has been pursued in good faith or a *permit* has been issued; except that the *building official* is authorized to grant one or more extensions of time for additional periods not exceeding 180 days each. The extension shall be requested in writing and justifiable cause demonstrated.	**R105.3.2 Time limitation of application.** An application for which no permit is issued within 180 days following the date of application shall become inactive, and plans and other data submitted for review thereafter shall be returned to the applicant or destroyed by the *building official*. The *building official* is authorized to grant one or more extensions of time for additional periods not to exceed 180 days each, for a maximum of two years from the date of the original application, upon written request and justifiable cause demonstrated by the applicant. If an application for permit does not result in a permit within two years after the date of original application, the permit application shall expire. In order to renew action on an application after expiration, the applicant shall submit a new permit application and plans and shall pay a new plan review fee. ~~An application for a *permit* for any proposed work shall be deemed to have~~	***City of Houston Amendment*** **Analysis:** A COH amendment was added to this code to include a time limit on permit applications that become inactive and eventually expires. This time limit is based on state law and historical city practice. ***No change to the technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.

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	~~been abandoned 180 days after the date of filing unless such application has been pursued in good faith or a *permit* has been issued; except that the *building official* is authorized to grant one or more extensions of time for additional periods not exceeding 180 days each. The extension shall be requested in writing and justifiable cause demonstrated.~~	
R105.4 Validity of permit. The issuance or granting of a *permit* shall not be construed to be a *permit* for, or an *approval* of, any violation of any of the provisions of this code or of any other ordinance of the *jurisdiction*. Permits presuming to give authority to violate or cancel the provisions of this code or other ordinances of the *jurisdiction* shall not be valid. The issuance of a *permit* based on *construction*	**R105.4 Validity of permit.** Permit validity shall be governed by Section 105.4 of the *Building Code*. ~~The issuance or granting of a permit shall not be construed to be a permit for, or an approval of, any violation of any of the provisions of this code or of any other ordinance of the *jurisdiction*. Permits presuming to give authority to violate or cancel the provisions of this code or other ordinances of the *jurisdiction* shall not be valid. The issuance of a permit based on construction documents and other data shall not prevent the building official from requiring the correction of errors in the construction documents and other data The building official is authorized to prevent occupancy or use of a structure where in violation of this code or of any other ordinances of this *jurisdiction*.~~	***City of Houston Amendment*** **Analysis:** A COH amendment was added to eliminate duplication and the possibility of conflict. ***No change to the technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R105.5 Expiration. Every *permit* issued shall become ~~invalid~~ inactive unless the work authorized by such *permit* is commenced within 180 days after its issuance, or if the work authorized by such *permit* is suspended or abandoned for a period of 180 days after the time the work is commenced. The *building official* is authorized to grant, in writing, one or more extensions of time, for periods not more than 180 days each. The extension shall be requested in writing and justifiable cause demonstrated. If work is not commenced under a permit within two years after the date of issuance or is abandoned at any time for a period of two years, the permit shall expire. In order to recommence work under an expired permit, the permit holder shall pay the full permit fee applicable and submit plans that comply with this code for the previously uninspected portion of the work. **Exception:** For the purpose of issuing a certificate of compliance, the *building official* may, upon request, reactivate a *permit* and perform a final inspection of work.	**R105.5 Expiration.** Every *permit* issued shall become ~~invalid~~ inactive unless the work authorized by such *permit* ~~is~~ has commenced and been inspected by a city inspector within 180 days after its issuance, or if the work authorized by such *permit* is suspended or abandoned for a period of 180 days after the time the work is commenced. If work has not commenced under a *permit* within two years after the date of issuance or is suspended or abandoned at any time for a period of two years, the *permit* shall expire. In order to recommence work under an expired *permit*, the *permit* holder shall pay the full applicable *permit* fee and submit plans that comply with this code for all uninspected work. **Exception:** For the purpose of issuing a certificate of compliance, the *building official* may, upon request, reactivate a *permit* and perform a final inspection of work.	***City of Houston Amendment*** **Analysis:** The previous COH amendment was modified to coincide with state law and historical city policy. ***No change to the technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
N/A	**R105.5.1 Extensions.** The *building official* is authorized to grant, in writing, one or more extensions of time for issued permits, for periods not more than 180 days each. The extension shall be requested in writing and justifiable cause demonstrated.	***City of Houston Amendment*** **Analysis:** A COH amendment was added to specifically address the Building Officials authority to provide permit extensions. ***No change to the technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R105.6 Suspension or revocation. The *building official* is authorized to suspend or revoke a *permit* issued under the provisions of this code wherever the *permit* is issued in error or on the basis of incorrect, inaccurate, or incomplete information, or in violation of any ordinance or regulation or any of the provisions of this code. Prior to taking such action the *building official* shall provide notice of a right to a hearing on the matter pursuant to Section 117 of the *Building Code*.	**R105.6 Suspension or revocation.** The *building official* is authorized to suspend or revoke a *permit* issued under the provisions of this code wherever the *permit* is issued in error or on the basis of incorrect, inaccurate, or incomplete information, or in violation of any ordinance, ~~or~~ regulation, or ~~any of the~~ provision~~s~~ of this code. Prior to taking such action, the *building official* shall provide notice of a right to a hearing on the matter pursuant to Section 117 of the *Building Code*.	***City of Houston Amendment*** **Analysis:** The previous COH amendment includes minor editorial changes. ***No change to the technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
{**EDITOR'S NOTE:** **DELETE** R106.1.3 IN ITS ENTIRETY.}	{**EDITORIAL NOTE:** DELETE SECTION R106.1.4 IN ITS ENTIRETY.}	***City of Houston Amendment***

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~~**R106.1.3 Information for construction in flood hazard areas.** For buildings and structures located in whole or in part in flood hazard areas as established by Table R301.2(1), construction documents shall include:~~ ~~**1.** Delineation of flood hazard areas, floodway boundaries and flood zones and the design flood elevation, as appropriate;~~ ~~**2.** The elevation of the proposed lowest floor, including basement; in areas of shallow flooding (AO Zones), the height of the proposed lowest floor, including basement, above the highest adjacent grade;~~ ~~**3.** The elevation of the bottom of the lowest horizontal structural member in coastal high hazard areas (V Zone); and~~ ~~**4.** If design flood elevations are not included on the community's Flood Insurance Rate Map (FIRM), the building official and the applicant shall obtain and reasonably utilize any design flood elevation and floodway data available from other sources.~~	~~**R106.1.4 INFORMATION FOR CONSTRUCTION IN FLOOD HAZARD AREAS.** FOR BUILDINGS AND STRUCTURES LOCATED IN WHOLE OR IN PART IN FLOOD HAZARD AREAS AS ESTABLISHED BY TABLE R301.2(1), CONSTRUCTION DOCUMENTS SHALL INCLUDE:~~ ~~**1.** DELINEATION OF FLOOD HAZARD AREAS, FLOODWAY BOUNDARIES AND FLOOD ZONES AND THE DESIGN FLOOD ELEVATION, AS APPROPRIATE.~~ ~~**2.** THE ELEVATION OF THE PROPOSED LOWEST FLOOR, INCLUDING BASEMENT; IN AREAS OF SHALLOW FLOODING (AO ZONES), THE HEIGHT OF THE PROPOSED LOWEST FLOOR, INCLUDING BASEMENT, ABOVE THE HIGHEST ADJACENT GRADE.~~ ~~**3.** THE ELEVATION OF THE BOTTOM OF THE LOWEST HORIZONTAL STRUCTURAL MEMBER IN COASTAL HIGH HAZARD AREAS (V ZONE) AND IN COASTAL A ZONES WHERE SUCH ZONES ARE DELINEATED ON FLOOD HAZARD MAPS IDENTIFIED IN TABLE R301.2(1) OR OTHERWISE DELINEATED BY THE JURISDICTION.~~ ~~**4.** IF DESIGN FLOOD ELEVATIONS ARE NOT INCLUDED ON THE COMMUNITY'S FLOOD INSURANCE RATE MAP (FIRM), THE BUILDING OFFICIAL AND THE APPLICANT SHALL OBTAIN AND REASONABLY UTILIZE ANY DESIGN FLOOD ELEVATION AND FLOODWAY DATA AVAILABLE FROM OTHER SOURCES.~~	**Analysis:** The previous COH amendment is carried forward. ***No change to the technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R108.2 Schedule of permit fees. On buildings, structures, electrical, gas, mechanical and plumbing systems or *alterations* requiring a *permit,* a fee for each *permit* shall be paid as required, in accordance with ~~the schedule as established by the applicable governing authority~~ the city fee schedule.	**R108.2 Schedule of permit fees.** On buildings, structures, electrical, gas, mechanical and plumbing systems or *alterations* requiring a *permit*, a fee for each *permit* shall be paid as required, in accordance with Section 118 of the *Building Code* and the ~~schedule as established by the applicable governing authority~~ *city fee schedule*.	***City of Houston Amendment*** **Analysis:** The previous COH amendment was modified to reference the IBC for fees. ***No change to the technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R108.3 Building permit valuations. Building *permit* valuation shall include total value of the work for which a *permit* is being issued, such as electrical, gas, mechanical, plumbing equipment and other permanent systems, including materials and labor.	**R108.3 Building permit fee calculation ~~valuations.~~** ~~Building *permit* valuation shall include total value of the work, for which a *permit* is being issued, such as electrical, gas, mechanical, plumbing *equipment* and other permanent systems, including materials and labor.~~ The structural building permit fee for new one- and two-family residential *dwellings* and townhouses and their detached *accessory structures* shall be calculated as specified in Section 118.2.1 and Tables 118(1) and 118(2) of the *Building Code* and the city fee schedule based on the total square footage of the *building area* as defined by the *Building Code*. The permit fee for new *additions* to one- and two-family residential *dwellings* and townhouses shall be calculated as required for new residential *buildings*. The permit fee for *repair*, *alterations*, or remodeling of residential one and two-family *dwellings* and townhouses shall be 20% of the calculated fee for new construction as specified in Section 118.2.1 and Tables 118(1) and 118(2) of the *Building Code* and the city fee schedule based on the total aggregate square footage of the *building area* being repaired or altered or the total aggregate square footage of the walls and ceilings being repaired or altered.	***City of Houston Amendment*** **Analysis:** A COH amendment changes the method of calculating a building permit fee for new SFR structures, additions, and alterations. Fees are based on the aggregate square footage of new construction plus the total square footage or alterations. New construction will be comparable to current method of calculating based on valuations. Alterations will be based on 20% of what a permit would be for new construction having the same square footage of the altered/repaired construction. **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R108.5 Refunds. The *building official* ~~is authorized to establish a refund policy~~ may authorize refunding of any fee paid hereunder that was erroneously paid or collected due to an error by one or more city employees. This provision shall not be applicable if the error occurred because of incorrect information provided by the applicant. The *building official* may authorize the refunding of not more than 90 percent of the amount in excess of the minimum fee established in the city fee schedule for the permit fee paid when no work has been done under a *permit* issued in accordance with this code. If work has been done under the *permit*, no refund shall be authorized.	**R108.5 Refunds.** The *building official* ~~is authorized to establish a refund policy~~ may authorize a refund of any fee paid hereunder that was erroneously paid or collected due to an error by a city employee. This provision shall not be applicable if the error occurred because of incorrect information provided by the applicant. The *building official* may authorize a refund of not more than 90 percent of the amount in excess of the minimum *permit* fee paid when no work has been done under a *permit* issued in accordance with this code. If work has been done under the *permit*, no refund shall be authorized. The originally paid administrative fee and the plan review portion of the *permit* fee shall be nonrefundable.	***City of Houston Amendment*** **Analysis:** The previous COH amendment applicable to refunds have been correlated to be the same throughout all volumes of the *Houston Construction Code*. ***No change to the technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.

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The *building official* shall not authorize refunding of any fee paid except on written application filed by the original permit holder not later than 180 days after the date of fee payment.	The *building official* shall not authorize a refund of any fee paid except on written application filed by the original permit holder not later than 180 calendar days after the date of fee payment.	
R108.6 Work commencing before permit issuance. Any person who commences work requiring a *permit* on a building, structure, electrical, gas, mechanical or plumbing system before obtaining the necessary *permits* shall be subject to a fee ~~established by the applicable governing authority~~ equal to the amount of the permit fee and applicable minimum investigation fees required by the building code that shall be in addition to the required *permit* fees.	**R108.6 Work commencing before *permit* issuance.** Any person who commences work requiring a *permit* on a building, structure, electrical, gas, mechanical, or plumbing system before obtaining the necessary permits shall be subject to a fee ~~established by the applicable governing authority~~ equal to the amount of the *permit* fee and applicable minimum investigation fees required by the *Building Code* that shall be in addition to the required *permit* fees.	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
N/A **2012 Houston Building Code Excerpt:** **118.1.12 Building plan review fee.** Plans submitted for a building permit shall be charged a non-refundable plan review fee. This plan review fee shall be charged as a deposit to the building permit fee. The fee shall be calculated at a rate of 25 percent of the estimated building permit fee calculated as provided in Section 118.2.1 and the city fee schedule. This fee shall be paid upon submittal for the initial review of plans. The balance of the building permit fee shall be collected when the permit is issued. In the instance that the building permit is not subsequently issued, the plan review fee deposit remains non-refundable.	**108.7 Plan review fees.** Where plans or other data is required to be submitted in accordance with the *Construction Code*, a plan review fee shall be paid at the time of submitting construction documents for review. The plan review fees for any proposed work shall be charged as described in Section 118.1.11 of the *Building Code* and the city fee schedule. When approved plans are lost or changed so as to require an additional plan review or when a plan review is required and there is no building permit required, a plan review fee shall be charged as described in Section 118.2.8 of the *Building Code* and the city fee schedule.	***City of Houston Amendment*** **Analysis:** The previous COH amendment relocated to this section. ***No change to the technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
N/A **2012 Houston Building Code Excerpt:** **118.2.8 Plan review fees.** Plan review fees, other than the building plan review fee provided for in Section 118.1.12, shall be as stated for this provision in the city fee schedule for review of the following: Manufactured home or recreational vehicle parks. Residential master plans. Reexamination of plans or deferred submittal of plans: Where deferred plans are submitted or previously approved plans are reexamined or revised, the plan review fee shall be as specified in the city fee schedule or 15 percent of the original building permit fee, whichever is greater. The fee for reexamination of partial plans shall be determined by the *building official* based on the review time involved.	**108.7.1 Deferred submittal plan review fees.** A plan review fee shall be paid at the time of submitting construction documents for review of deferred submittal plans. The fee for any deferred submittal review shall be charged at the rate shown in the city fee schedule for a minimum permit fee plus applicable administrative fee. The plan review fees specified in this subsection are separate fees from the permit fees.	***City of Houston Amendment*** **Analysis:** The previous COH amendment was reorganized and relocated to this section. ***No change to the previous COH technical code requirements or code intent.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R108.7 Annual fee increase. Notwithstanding any maximum fee established pursuant to the *Construction Code*, the fees in this or in any volume of the *Construction Code*, as adjusted according to this section, shall be automatically increased on the first day of each subsequent calendar year as provided in Section 1-13 of the *City Code*.	**N/A** **2015 Houston Building Code Excerpt:** **118.1.16 Annual fee increase.** Notwithstanding any maximum fee established pursuant to the *Construction Code*, the fees in this or in any volume of the *Construction Code*, as adjusted according to this section, shall be automatically increased on the first day of each subsequent calendar year as provided in Section 1-13 of the *City Code*.	***City of Houston Amendment*** **Analysis:** The previous COH amendment was omitted from this code and retained in the Building Code. ***No change to the previous technical code requirement or code intent.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R109.1.3 Floodplain inspections. For construction in flood hazard areas, inspections shall be in accordance with Chapter 19 of the *City Code*. ~~as established by Table R301.2(1), upon placement of the lowest floor, including *basement*, and prior to further vertical construction, the *building official* shall require submission of~~	**R109.1.3 Floodplain inspections.** For construction in flood hazard areas as established by Table R301.2(1), upon placement of the lowest floor, including basement, and prior to further vertical construction, the building official shall require submission of documentation, prepared, and sealed by a registered design	***City of Houston Amendment*** **Analysis:** The previous COH amendment was omitted and the model code requirements retained. ***There is no change to the technical code requirements or code intent associated with***

~~documentation, prepared, and sealed by a registered *design professional,* of the elevation of the lowest floor, including *basement,* required in Section R322.~~	professional, of the elevation of the lowest floor, including basement, required in Section R322.	***these requirements that must be submitted as part of the Flood Department requirements.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
SECTION R110 **CERTIFICATE OF ~~OCCUPANCY~~ COMPLIANCE** **R110.1 Use and occupancy.** When requested by the applicant, the *building official* is authorized to issue a certificate of compliance after all the final inspections have been approved. ~~No building or structure shall be used or occupied, and no change in the existing occupancy classification of a building or structure or portion thereof shall be made until the *building official* has issued a certificate of occupancy therefor as provided herein. Issuance of a certificate of occupancy shall not be construed as an approval of a violation of the provisions of this code or of other ordinances of the *jurisdiction.* Certificates presuming to give authority to violate or cancel the provisions of this code or other ordinances of the *jurisdiction* shall not be valid.~~ ~~**Exceptions:**~~ ~~1. Certificates of occupancy are not required for work exempt from permits under Section R105.2.~~ ~~2. Accessory buildings or structures.~~	**SECTION R110** **CERTIFICATE OF ~~OCCUPANCY~~ COMPLIANCE** **R110.1 Use and occupancy.** ~~A~~ Group R3 *One- and Two-family Dwellings* and *Townhouses* and associated residential accessory buildings or structures shall not be used or occupied, and a change in the existing use or occupancy classification of a building or structure or portion thereof to a building or structure regulated by this code shall not be made, until the *building official* has issued a certificate of ~~occupancy~~ compliance therefor as provided herein. Issuance of a certificate of ~~occupancy~~ compliance shall not be construed as an approval of a violation of the provisions of this code or of any other ordinances of the *jurisdiction*. Certificates presuming to give authority to violate or cancel the provisions of this code or other ordinances of the *jurisdiction* shall not be valid. **Exceptions:** 1. ~~A C~~certificate~~s~~ of compliance ~~occupancy are~~ is not required for work exempt from permits under Section R105.2. 2. ~~Accessory buildings or structures.~~ A certificate of occupancy is not required for a Group U occupancy accessory to a single-family dwelling or *townhouse* not containing hazardous materials exceeding the maximum allowable quantities identified in Section 307 of the *Building Code*.	***City of Houston Amendment*** **Analysis:** The previous COH amendment was modified to now require a Certificate of Compliance (CC) prior to occupying any new *One- or Two-family dwelling* or *townhouse*. These new code provisions will require every new building project, building addition, or occupancy or use change to obtain final inspections and project final to obtain the required CC. **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R110.2 Change in use. Changes in the character or use of an existing structure shall not be made except as specified in Section~~s 3408 and 3409~~ 3412.2.1 of the *Building Code* and Appendix M of the ~~*International*~~ *Building Code.*	**R110.2 Change in use.** Changes in the character or use of an existing structure shall not be made except as specified in Sections ~~3408 and 3409~~ 407, 506, and 1205, and Chapter 10 of the ~~*International*~~ *Existing Building Code.*	***City of Houston Amendment*** **Analysis:** The previous COH amendment was modified to provide the correct code references. ***No change to the technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
{EDITOR'S NOTE: DELETE R110.3, R110.4 AND R110.5 IN THEIR ENTIRETY.**}** ~~**R110.3 Certificate issued.** After the building official inspects the building or structure and finds no violations of the provisions of this code or other laws that are enforced by the department of building safety, the building official shall issue a certificate of occupancy which shall contain the following:~~ ~~**1.** The building permit number.~~ ~~**2.** The address of the structure.~~ ~~**3.** The name and address of the owner.~~ ~~**4.** A description of that portion of the structure for which the certificate is issued.~~ ~~**5.** A statement that the described portion of the structure has been inspected for compliance with the requirements of this code.~~ ~~**6.** The name of the building official.~~ ~~**7.** The edition of the code under which the permit was issued.~~ ~~**8.** If an automatic sprinkler system is provided and whether the sprinkler system is required.~~ ~~**9.** Any special stipulations and conditions of the building permit.~~	**R110.3 Certificate issued.** After the building official inspects the building or structure and does not find violations of the provisions of this code or other laws that are enforced by ~~the department of building safety~~ Building Code Enforcement, the *building official* shall issue a certificate of compliance ~~occupancy~~ containing the following: **1.** The building permit number or project number. **2.** The address of the structure. **3.** The name and address of the owner and when applicable ~~or~~ the owner's authorized agent. **4.** Where applicable a ~~A~~ description of that portion of the structure for which the certificate is issued. **5.** A statement that the described portion of the structure has been inspected for compliance with the requirements of this code. **6.** The name of the *building official*. **7.** The edition of the code under which the permit was issued. **8.** If an automatic sprinkler system is provided, and whether the sprinkler system is required. **9.** Any special stipulations and conditions of the building permit. **10.** The use and occupancy of the building.	***City of Houston Amendment*** **Analysis:** The model code is retained and a COH amendment was added to identify specific information on the new required CC. **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
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	11. The type of construction as defined by Chapter 6 of the *Building Code*.	
{**EDITOR'S NOTE: DELETE** R110.3, R110.4 AND R110.5 IN THEIR ENTIRETY.} ~~**R110.4 Temporary occupancy.** The building official is authorized to issue a temporary certificate of occupancy before the completion of the entire work covered by the permit, provided that such portion or portions shall be occupied safely. The building official shall set a time period during which the temporary certificate of occupancy is valid.~~	**R110.4 Temporary occupancy.** The building official is authorized to issue a temporary certificate of compliance ~~occupancy~~ before the completion of the entire work covered by the permit, provided that such portion or portions shall be occupied safely. The building official shall set a time period during which the temporary certificate of compliance ~~occupancy~~ is valid.	***City of Houston Amendment*** **Analysis:** A COH amendment was added for clarity. **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
{**EDITOR'S NOTE: DELETE** R110.3, R110.4 AND R110.5 IN THEIR ENTIRETY.} ~~**R110.5 Revocation.** The building official shall, in writing, suspend or revoke a certificate of occupancy issued under the provisions of this code wherever the certificate is issued in error, or on the basis of incorrect information supplied, or where it is determined that the building or structure or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.~~	**R110.5 Revocation.** The *building official* is authorized to ~~shall, in writing,~~ suspend or revoke a certificate of compliance ~~occupancy~~ issued under the provisions of this code in writing, wherever the certificate is issued in error, or on the basis of incorrect information supplied, or where it is determined that the building or structure or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code. Prior to taking such action, the *building official* shall provide notice of a right to a hearing on the matter pursuant to Section 117 of the *Building Code*.	***City of Houston Amendment*** **Analysis:** A COH amendment was added. ***No change to the technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
N/A	**R110.6 Certificate of compliance availability.** The *certificate of compliance* shall be available on the premises and shall not be removed except by the *building official*. The owner shall maintain the correct information on the *certificate of compliance*. The *code official* and *fire code official* shall require correction of any errors on a *certificate of occupancy* or *certificate of compliance*.	***City of Houston Amendment*** **Analysis:** A COH amendment was added to clarify that the required Certificate of Compliance be available for review at the residence. This is a standard COH practice for all buildings. **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R112.1 General. ~~In order to~~ Except as provided below for mechanical and plumbing issues, the General Appeals Board, in accordance with the provisions of the *Building Code*, shall hear and decide appeals of orders, decisions or determinations made by the *building official* relative to the application and interpretation of this code~~, there shall be and is hereby created a board of appeals. The *building official* shall be an ex officio member of said board but shall have no vote on any matter before the board. The board of appeals shall be appointed by the governing body and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business, and shall render all decisions and findings in writing to the appellant with a duplicate copy to the *building official*~~.	**R112.1 General.** ~~In order to~~ Except as provided below for mechanical and plumbing issues, the General Appeals Board, in accordance with the provisions of the *Building Code*, shall hear and decide appeals of orders, decisions or determinations made by the *building official* relative to the application and interpretation of this code~~, there shall be and is hereby created a board of appeals. The *building official* shall be an ex officio member of said board but shall not have a vote on any matter before the board. The board of appeals shall be appointed by the governing body and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business, and shall render decisions and findings in writing to the appellant with a duplicate copy to the *building official*~~.	***City of Houston Amendment*** **Analysis:** The existing COH amendment is carried forward. ***No change to the previous technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R112.2 Mechanical. The Mechanical Code Review Board, in accordance with the provisions of the *Mechanical Code*, shall hear and decide appeals of orders, decisions or determinations made by the *building official* relative to the application and interpretation of Part V—Mechanical ~~**Limitations on authority.** An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of this code do not fully apply, or an equally good or better form of construction is proposed. The board shall have no authority to waive requirements~~ of this code.	**R112.2 Mechanical.** The Mechanical Code Review Board, in accordance with the provisions of the *Mechanical Code,* shall hear and decide appeals of orders, decisions or determinations made by the *building official* relative to the application and interpretation of Part V-Mechanical ~~**Limitations on authority.** An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of this code do not fully apply, or an equally good or better form of construction is proposed. The board shall not have authority to wave requirements~~ of this code.	***City of Houston Amendment*** **Analysis:** No changes made to the previous COH amendment. ***No change to the previous technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
{**EDITOR'S NOTE: DELETE** SECTIONS R112.2.1 AND R112.2.2 IN THEIR ENTIRETY.} ~~**R112.2.1 Determination of substantial improvement in flood hazard areas.** When the building official provides a finding required in Section R105.3.1.1, the board of appeals shall determine whether the value of the proposed work constitutes a substantial improvement. A substantial improvement means any repair, reconstruction, rehabilitation, addition or improvement of a building or structure, the cost of which equals or exceeds 50 percent of the market value of the building or structure before the improvement or repair is started. If the building or structure has~~	**N/A – Relocated to R105.3.1.1**	***City of Houston Amendment*** **Analysis:** The code provisions of IRC 2015 Section R112.2.1 was relocated to Section R105.3.1.1 of the model code. ***No change to the previous technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.

~~sustained substantial damage, all repairs are considered substantial improvement regardless of the actual repair work performed. The term does not include:~~ ~~**1.** Improvements of a building or structure required to correct existing health, sanitary or safety code violations identified by the building official, and which are the minimum necessary to assure safe living conditions; or~~ ~~**2.** Any alteration of an historic building or structure, provided that the alteration will not preclude the continued designation as an historic building or structure. For the purpose of this exclusion, an historic building is:~~ ~~**2.1.** Listed or preliminarily determined to be eligible for listing in the National Register of Historic Places; or~~ ~~**2.2.** Determined by the Secretary of the U.S. Department of Interior as contributing to the historical significance of a registered historic district, or a district preliminarily determined to qualify as an historic district; or~~ ~~**2.3.** Designated as historic under a state or local historic preservation program that is approved by the Department of Interior.~~		
{EDITOR'S NOTE: DELETE SECTIONS R112.2.1 AND R112.2.2 IN THEIR ENTIRETY.**}** ~~**R112.2.2 Criteria for issuance of a variance for flood hazard areas.** A variance shall be issued only upon:~~ ~~**1.** A showing of good and sufficient cause that the unique characteristics of the size, configuration or topography of the site render the elevation standards in Section R322 inappropriate.~~ ~~**2.** A determination that failure to grant the variance would result in exceptional hardship by rendering the lot undevelopable.~~ ~~**3.** A determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances.~~ ~~**4.** A determination that the variance is the minimum necessary to afford relief, considering the flood hazard.~~ ~~**5.** Submission to the applicant of written notice specifying the difference between the design flood elevation and the elevation to which the building is to be built, stating that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced floor elevation, and stating that construction below the design flood elevation increases risks to life and property.~~	**N/A – Relocated to R104.10.1**	***City of Houston Amendment*** **Analysis:** The IRC 2012 model code provisions of Section R112.2.2 was relocated to IRC 2015 Section R104.10.1. However, no changes were made to the COH amendment which deletes the provisions of this section in its entirety. See R104.10.1 ***No change to the previous technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R112.3 Plumbing. The Plumbing Code Review Board, in accordance with the provisions of the *Plumbing Code*, shall hear and decide appeals of orders, decisions or determinations made by the *building official* relative to the application and interpretation of Part VI—Fuel Gas and Part VII—Plumbing of this code **Qualifications.** ~~The board of appeals shall consist of members who are qualified by experience and training to pass on matters pertaining to building construction and are not employees of the *jurisdiction*.~~	**R112.3 Plumbing.** The Plumbing Code Review Board, in accordance with the provisions of the *Plumbing Code*, shall hear and decide appeals of orders, decisions or determinations made by the *building official* relative to the application and interpretation of Part VI- Fuel Gas and Part VII- Plumbing of this code **Qualifications.** ~~The board of appeals shall consist of members who are qualified by experience and training to pass on matters pertaining to building construction and are not employees of the *jurisdiction*.~~	***City of Houston Amendment*** **Analysis:** No changes were made to the previous COH amendment. ***No change to the previous technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R113.4.1 Penalty. Where no specific penalty is otherwise provided therein, the violation of any provision of this code or the modifications adopted by this jurisdiction shall constitute a misdemeanor punishable upon conviction by a fine of not less than $500.00 nor more than $2,000.00. Each day that any violation continues shall constitute and be punishable as a separate offense. Where any such conduct constitutes a violation of state penal law, then the offense shall be punishable as provided in the applicable state law. In prosecutions, the various provisions of this code or the jurisdiction's modifications that are designated as an 'exception' or	**R113.4.1 Penalty.** Where no specific penalty is otherwise provided in this code, the violation of any provision of this code shall constitute a misdemeanor punishable upon conviction by a fine of not less than $500.00 nor more than $2,000.00. Each day that any violation continues shall constitute and be punishable as a separate offense. Where any such conduct constitutes a violation of state penal law, then the offense shall be punishable as provided in the applicable state law. In prosecutions under this code, the various provisions hereof that are designated as an "exception" or "exceptions" shall not be treated as exceptions within the meaning of Section 2.02 of	***City of Houston Amendment*** **Analysis:** The previous COH amendment was modified by city legal for clarity. ***No change to the previous technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.

'exceptions' shall not be treated as exceptions within the meaning of Section 2.02 of the Texas Penal Code, and, instead, they shall constitute defenses to prosecution within the meaning of Section 2.03 of the Texas Penal Code.	the *Texas Penal Code*, and, instead, they shall constitute defenses to prosecution within the meaning of Section 2.03 of the *Texas Penal Code*.	
SECTION 115 **PRIVATE PLAN REVIEW AND INSPECTION SERVICES** **R115.1 Applicability.** The application of this section is limited to structures that are constructed under this code.	**SECTION 115** **PRIVATE PLAN REVIEW AND INSPECTION SERVICES** **R115.1 Applicability.** This section applies to any required *permit* for the construction, repair, or renovation of anyone- or two-family residence or townhouse and associated accessory structures.	***City of Houston Amendment*** **Analysis:** The previous COH amendment was modified to combine the code provisions of 2012 IRC code sections R115.1 and 115.2. ***No change to the previous technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R115.2 Scope. This section applies to any *permit* required under this code, the *Electrical Code*, the *Plumbing Code*, or the *Mechanical Code* for the construction, repair, or renovation of a structure to which this code applies.	**N/A – Previous text relocated to Section R115.1**	***City of Houston Amendment*** **Analysis:** The amendment previously in IRC Section R115.2 has been combined with the text of Section R115.1 in the 2015 IRC. ***No change to the previous technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R115.3 Program established. The *building official* may establish a private plan review and inspection program under which qualified persons who are not city employees may review plans, conduct certain building inspections, and provide related services for structures to which this section applies to assure compliance with all applicable construction codes. The program shall be conducted in accordance with the regulations and forms promulgated by the *building official*, which shall, without limitation, address the following: **1.** Qualifications of the firms and individuals authorized to perform plan reviews, conduct inspections, and provide other related *permit* services. The qualifications shall include licensing in accordance with any applicable laws and regulations and certification in accordance with state or federally recognized standards. **2.** Requirement of appropriate liability coverages in an amount of not less than $1,000,000, per occurrence, with indemnity agreements and coverage of the jurisdiction, as an additional insured, for the protection of the jurisdiction and other persons who may be affected by the performance of the any services under the program. **3.** Provisions to ensure that the firms and individuals participating in the program will act independently of building owners, contractors, and others so as to avoid conflicts of interest. **4.** Provisions for any non-building-code-related review of plans and issuance of *permit*s to applicants who utilize plan review, inspection, and other related services under the program. **5.** Provisions regarding the keeping of records and filing of reports with the *building official*. **6.** Administrative provisions for the acceptance, suspension, and revocation of the right of a firm or individual to participate in the program, which shall include elements of due process, including a right of appeal to a hearing officer designated by the jurisdiction's Director of Public Works and Engineering, whose decision, notwithstanding any other provision of this code, shall be final and not appealable to the General Appeals Board or City Council.	**R115.2 Program established.** The *building official* may establish a private plan review and inspection program under which qualified persons who are not city employees may review plans, conduct certain building inspections, and provide related services for structures to which this section applies to assure compliance with all applicable construction codes. The program shall be conducted in accordance with the regulations and forms promulgated by the *building official*, which shall, without limitation, address the following: **1.** Qualifications of the firms and individuals authorized to perform plan reviews, conduct inspections, and provide other related *permit* services. The qualifications shall include licensing in accordance with any applicable laws and regulations and certification in accordance with state or federally recognized standards. **2.** Requirement of appropriate liability coverages in an amount of not less than $1,000,000 per occurrence, with indemnity agreements and coverage of the *jurisdiction*, as an additional insured, for the protection of the *jurisdiction* and other persons who may be affected by the performance of any services under the program. **3.** Provisions to ensure that the firms and individuals participating in the program will act independently of building owners, contractors, and others so as to avoid conflicts of interest. **4.** Provisions for any non-building-code-related review of plans and issuance of *permits* to applicants who utilize plan review, inspection, and other related services under the program. **5.** Provisions regarding the keeping of records and filing of reports with the *building official*. **6.** Administrative provisions for the acceptance, suspension, and revocation of the right of a firm or individual to participate in the program, which shall include elements of due process, including a right of appeal to a hearing officer designated by the director of Houston Public Works, whose decision, notwithstanding any other provision of this code, shall be final and not appealable to the General Appeals Board or city council.	***City of Houston Amendment*** **Analysis:** One minor editorial change to previous COH amendment to address new Houston Public Works department name. ***No change to the previous technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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7. Provisions to ensure that no firm or individual may be certified to participate in the program unless qualified to conduct plan reviews and inspections under the Codes currently enforced by the jurisdiction and/or a nationally recognized uniform or international code.

8. Provisions relating to fees charged by any firm or individual for services rendered under the program, including any fees required by law to be paid directly to the jurisdiction and remitted by the *building official* to a firm or individual.

9. Provisions prohibiting any private developer, builder, or contractor from employing any firm or individual, including subcontractors, to perform more than 25% of that developer's, builder's or contractor's services under the program in any one calendar year unless a greater amount is approved by the *building official*.

10. Provisions requiring any private developer, builder or contractor utilizing any services under the program and the *building official* to file reports as set forth below:

a. Each private developer, builder or contractor utilizing any services under the program shall file a report with the *building official*, supported by affidavit, containing the following information:

(1) The total number of *permits* received during the preceding calendar year for the construction of any residential structure in connection with which services under the program were rendered;

(2) The name of each firm or individual utilized under the program on each residential structure during the reporting period; and

(3) A statement certifying that the developer, builder or contractor has fully complied with all rules and regulations under the program during the reporting period, including but not limited to, all rules governing the maximum number of plan reviews and inspections permitted to be performed by any firm or individual, including subcontractors, rendering any services under the program.

The report shall be filed with the *building official* not later than the last day of January and July in each calendar year and shall cover the preceding six-month period ending on the last day of December and June, respectively, in each year.

b. The *building official* shall file a report with the Mayor and City Council containing the following information:

(1) A listing of the names of all companies or contractors that utilized individuals or firms for services under the program and the name of each firm or individual so utilized;

(2) Names of all firms and individuals approved to perform services under the program;

(3) Total number of plan reviews and inspections performed by firms and individuals for each private developer, builder or contractor operating under the program;

(4) Number of plan rechecks and oversight inspections conducted by the jurisdiction for each firm or individual utilized under the program and the percentage of that firm or individual's work, including subcontractors, so inspected;

(5) The number of Code violations found through plan rechecks and oversight inspections, including the name of the firm or individual, including subcontractors, who performed such services;

(6) A list of any firms or individuals removed from the program by the *building official*; and

7. Provisions to ensure that no firm or individual may be certified to participate in the program unless qualified to conduct plan reviews and inspections under the codes currently enforced by the *jurisdiction* and/or a nationally recognized uniform or international code.

8. Provisions relating to fees charged by any firm or individual for services rendered under the program, including any fees required by law to be paid directly to the *jurisdiction* and remitted by the *building official* to a firm or individual.

9. Provisions prohibiting any private developer, builder or contractor from employing any firm or individual, including subcontractors, to perform more than 25% of that developer's, builder's or contractor's services under the program in any one calendar year unless a greater amount is approved by the *building official*.

10. Provisions requiring any private developer, builder or contractor utilizing any services under the program and the *building official* to file reports as set forth below:

10.1 Each private developer, builder or contractor utilizing any services under the program shall file a report with the *building official*, supported by affidavit, containing the following information:

10.1.1. The total number of *permits* received during the preceding calendar year for the construction of any residential *structure* in connection with which services under the program were rendered;

10.1.2. The name of each firm or individual utilized under the program on each residential structure during the reporting period; and

10.1.3. A statement certifying that the developer, builder, or contractor has fully complied with all rules and regulations under the program during the reporting period, including but not limited to, all rules governing the maximum number of plan reviews and inspections permitted to be performed by any firm or individual, including subcontractors, rendering any services under the program.

The report shall be filed with the *building official* not later than the last day of January and July in each calendar year and shall cover the preceding six-month period ending on the last day of December and June, respectively, in each year.

10.2 The *building official* shall file a report with the mayor and city council containing the following information:

10.2.1. A listing of the names of all companies or contractors that utilized individuals or firms for services under the program and the name of each firm or individual so utilized;

10.2.2. Names of all firms and individuals approved to perform services under the program;

10.2.3. Total number of plan reviews and inspections performed by firms and individuals for each private developer, builder or contractor operating under the program;

10.2.4. Number of plan rechecks and oversight inspections conducted by the *jurisdiction* for each firm or individual utilized under the program and the percentage of that firm or individual's work, including that performed by subcontractors, so inspected;

10.2.5. The number of code violations found through plan rechecks and oversight inspections, including the name of the firm or individual, including subcontractors, who performed such services;

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
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(7) An assessment of program effectiveness as demonstrated by available data, including comments and complaints received by the jurisdiction regarding the program pertaining to work performed by a participating developer, builder or contractor, or any firm or individual, including subcontractors, providing private plan review or inspection services under the program. The *building official*'s report shall be filed with the Mayor and City Council not later than the last day of August and February in each calendar year and shall cover the preceding 6-month period ending on the last day of July and January, respectively, in each year and may include such additional information relating to the program as he may deem appropriate. **11.** Provisions prohibiting any private plan reviewer or inspector from being related to building owners, contractors, and other similarly situated individuals or entities within the third degree of consanguinity or within the second degree of affinity.	**10.2.6.** A list of any firms or individuals removed from the program by the *building official*; and **10.2.7.** An assessment of program effectiveness as demonstrated by available data, including comments and complaints received by the *jurisdiction* regarding the program pertaining to work performed by a participating developer, builder or contractor, or any firm or individual, including subcontractors, providing private plan review or inspection services under the program. The *building official's* report shall be filed with the mayor and city council not later than the last day of August and February in each calendar year and shall cover the preceding 6-month period ending on the last day of July and January, respectively, in each year and may include such additional information relating to the program as he may deem appropriate. **11.** Provisions prohibiting any private plan reviewer or inspector from being related to *building owners*, contractors, and other similarly situated individuals or entities within the third degree of consanguinity or within the second degree of affinity.	
R115.4 Oversight inspections. The provisions of this section do not affect the jurisdiction of the *building official* over any work or preclude oversight inspections by the *building official* of structures that are subject to the provision of services under the program. For purposes of quality assurance, the *building official* shall be authorized to recheck plans, perform inspections or reinspections, issue stop work orders, and take any and all actions that are authorized to be taken under this code, the *Electrical Code*, the *Plumbing Code*, or the *Mechanical Code*. No prior notice need be provided to any program firm or individual, contractor, or owner, unless otherwise required by law.	**R115.3 Oversight inspections.** The provisions of this section do not affect the *jurisdiction* of the *building official* over any work or preclude oversight inspections by the *building official* of structures that are subject to the provision of services under the program. For purposes of quality assurance, the *building official may* recheck plans, perform inspections or reinspections, issue stop work orders, and take any and all actions that are authorized to be taken under this code, the *Electrical Code*, the *Plumbing Code*, or the *Mechanical Code*, without providing prior notice to any program firm or individual, contractor, or owner, unless otherwise required by law.	***City of Houston Amendment*** **Analysis:** The previous COH amendment includes minor editorial changes. ***No change to the previous technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
R115.5 Fees. To cover administrative costs, including registration of firms and individuals, management of the program, and oversight inspections, the *building official* shall assess fees equal to 25 percent of the amount otherwise payable under this code for any *permit*, but not less than the minimum fee stated in the city fee schedule. In addition to the reduced *permit* fees charged in connection with the program, an additional fee for each payment voucher issued, as stated for this provision in the city fee schedule, shall be assessed to cover the jurisdiction's costs in connection with any fee required to be paid to and remitted by the jurisdiction. If any contractor or owner requests an inspection by the *building official* of any structure that is subject to private inspection under this section, then the *building official* may perform the inspection for the fee stated for this provision in the city fee schedule. The administrative fee that is payable under Section 118.1 of the *Building Code* shall be collected in addition to the fees otherwise provided under this section. Notwithstanding any maximum fee established pursuant to the *Construction Code*, the fees in this section or in any volume of the *Construction Code*, as adjusted according to this provision, shall be automatically increased on the first day of each subsequent calendar year as provided in Section 1-13 of the *City Code*.	**R115.4 Fees.** To cover administrative costs of the program established under Section R115, including registration of firms and individuals, management of the program, and oversight inspections, the *building official* shall assess fees equal to 25 percent of the amount otherwise payable under this code for any *permit*, but not less than the minimum fee stated in the city fee schedule. In addition to the reduced *permit* fees charged in connection with the program, an additional fee for each payment voucher issued, as stated for this provision in the city fee schedule, shall be assessed to cover the *jurisdiction*'s costs in connection with any fee required to be paid to and remitted by the *jurisdiction*. If any contractor or owner requests an inspection by the *building official* of any structure that is subject to private inspection under this section, then the *building official* may perform the inspection for the fee stated for this provision in the city fee schedule. The administrative fee that is payable under Section 118.1 of the *Building Code* shall be collected in addition to the fees otherwise provided under this section. Notwithstanding any maximum fee established pursuant to the *Construction Code*, the fees in this section or in any volume of the *Construction Code*, as adjusted according to this provision, shall be automatically increased on the first day of each subsequent calendar year as provided in Section 1-13 of the *City Code.*	***City of Houston Amendment*** **Analysis:** The previous COH amendment includes minor editorial changes. ***No change to the previous technical code requirements or code intent of this section.*** **Justification:** Chapter 1 is the legal administration and enforcement chapter governed by state law and separately reviewed by the City Legal Department.
2012 Houston IRC – Chapter 2 Definitions	**2015 Houston IRC – Chapter 2 Definitions**	**Code Analysis**

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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SECTION R202 **DEFINITIONS** **R201.3 Terms defined in other codes.** Where terms are not defined in this code and are defined in the *Building Code*, *International Fire Code*, *Electrical Code*, *Mechanical Code* or *Plumbing Code*, such terms shall have meanings ascribed to them as in those ~~other~~ codes ~~publications of the International Code Council~~.	**SECTION R202** **DEFINITIONS** **R201.3 Specific construction and ~~T~~terms defined in other codes.** Where specific rules of construction or terms are not addressed or defined in this code and are addressed or defined in the *City Code* or another volume of the *Construction Code*, such terms or specific constructions herein shall have the meanings ascribed ~~to them as~~ to them in those other volumes, as applicable to the construction and proposed scope of work hereunder ~~in other code publications of the International Code Council~~.	***City of Houston Amendment*** **Analysis:** The existing amendment was modified for clarity. This section clearly identifies that where there is specific rules of construction or terms not included in this code but addressed in other volumes of the Houston Code those rules continue to be applicable as if they were provided in the IRC. ***No change to the previous technical code requirements or code intent of this section.*** **Justification:** An amendment was needed to reference local adopted codes rather than model codes. To be consistent with previous COH interpretations this section needed modifications to address required construction associated with other provisions of the Houston Construction Code and/or City Code of Ordinances that is not included in the text of the existing Houston IRC.
SECTION R202 **DEFINITIONS** **ALLEY – N/A** **ALTERATION.** Any construction or renovation to an existing structure other than repair or addition that requires a permit. Also, a change in a mechanical system that involves an extension, addition or change to the arrangement, type or purpose of the original installation that requires a permit. **ATTIC, HABITABLE.** A finished or unfinished area, not considered a story, complying with all of the following requirements: **1.** The occupiable floor area is at least 70 square feet (17 m^2), in accordance with Section R304, **2.** The occupiable floor area has a ceiling height in accordance with Section R305, and **3.** The occupiable space is enclosed by the roof assembly above, knee walls (if applicable) on the sides and the floor-ceiling assembly below. **AUTHORITY HAVING JURISDICTION – N/A**	**SECTION R202** **DEFINITIONS** **ALLEY.** A public or private right-of-way that is not used primarily for through traffic and that provides vehicular access to rear entrances to buildings or properties that front on an adjacent street. **[RB] ALTERATION.** Any construction, retrofit or renovation to an existing structure other than repair or addition that requires a permit. Also, a change to an existing ~~in a~~ building, or changes to existing electrical, gas, mechanical or plumbing system that involves an extension, addition or change to the arrangement, type or purpose of the original installation that requires a permit. **ATTIC, HABITABLE.** A finished ~~or unfinished~~ area, not considered a *story*, complying with all of the following requirements: **1.** The occupiable floor area ~~at least~~ is not less than 70 square feet (17m^2), in accordance with Section R304~~, and~~. **2.** The occupiable floor area has a ceiling height in accordance with Section R305. **3.** The occupiable space is enclosed by the roof assembly above, knee walls ~~(if applicable)~~ on the sides and the floor-ceiling assembly below. The occupiable space is within a one- or two- family dwelling containing not more than two stories above grade plane in height. **AUTHORITY HAVING JURISDICTION.** The director of Houston Public Works or the director's duly authorized representative.	***City of Houston Amendment*** **Analysis:** COH amendments added to correlate with specific terms provided in the *City Code* and to clarify certain terms used in the codes, or to clarify the code intent for the terms defined. *CHANGE SIGNIFICANCE: The definitions contained within the IRC are intended to reflect the special meaning of such terms within the scope of the code. As terms can often have multiple meanings within their ordinary day-to-day use or within the various disciplines of the construction industry, it is important that their meanings within the context of the IRC be understood. Most definitions used throughout the IRC are found in Chapter 2, but additional definitions specific to the applicable topics are found in the energy provisions of Chapter 11, the fuel gas provisions of Chapter 24, and the electrical provisions of Chapter 35.* **Justification:** Legal has been added this amendment per 10-12-2021 blackline file. Added alley definition from IBC to coordinate the IRC, IFC and IBC. An amendment was needed to define "habitable attic" to differentiate between it and the definition of a story, and to place limitations on it. It is a critical distinction when it comes to the difference between a single-story and a multi-story house where sprinkler requirements may be triggered and to address certain deed restricted neighborhoods. Legal has been added this amendment per 10-12-2021 blackline file.
BUILDING CODE. The *City of Houston Building Code*, as adopted by this jurisdiction. **BUILDING OFFICIAL.** The ~~officer or other designated authority charged with the administration and enforcement of this code~~ jurisdiction's Director of Public Works and Engineering, or a duly authorized representative. **BUILDING THERMAL ENVELOPE.** The *basement walls*, *exterior walls*, floor, roof and any other building element that enclose *conditioned spaces*. This boundary also includes the boundary between conditioned space and any exempt or unconditioned space.	**BUILDING CODE.** The *City of Houston Building Code*, as adopted and amended by this *jurisdiction*. **[RB] BUILDING OFFICIAL** The ~~officer or other designated authority charged with the administration and enforcement of this code~~ director of Houston Public Works or the duly authorized representative designated by the director to act as the chief construction code enforcement official of the *jurisdiction*; also known as *chief building official*. The term also includes the Houston Airport Systems building official who may be designated by the building official to perform *Construction Code* permitting and enforcement activities on Houston Airport Systems premises. **[RE] BUILDING THERMAL ENVELOPE.** The boundary formed by *basement walls, exterior walls,* floor, roof and any other building element that encloses	***City of Houston Amendment*** **Analysis:** The previous COH amendment was modified to address administration practices of *Building Code Enforcement*. **Justification:** These amendments are modified to clarify the origin of code language and to reflect job titles in an accurate manner and to reference codes and standards adopted by the jurisdiction.

	conditioned space. This boundary also includes the boundary between conditioned space and any exempt or unconditioned space.	
CERTIFICATE OF COMPLIANCE – N/A ***CITY CODE.*** The *Code of Ordinances, Houston, Texas.* **CITY FEE SCHEDULE – N/A** **CODE OFFICIAL – N/A** ***CONSTRUCTION CODE.*** The *City of Houston Construction Code*, consisting of the *Building Code, Electrical Code, Mechanical Code, Plumbing Code, Residential Code, Commercial Energy Conservation Code,* and *Residential Energy Conservation Code*. **CONTROL JOINT – N/A**	**CERTIFICATE OF COMPLIANCE.** A certificate stating that materials and products meet specified standards or that the scope of work under a specific permit was done in compliance with approved construction documents. Any reference in the *Construction Code* to a "CC", certificate of completion, or a certificate of inspection issued by this *jurisdiction*, is a reference to a certificate of compliance as defined herein. **CITY CODE.** The *Code of Ordinances, City of Houston, Texas.* **CITY FEE SCHEDULE.** The schedule of fees charged by the city for various permits, licenses, authorizations, and services, which is maintained on the city's website. **[RE] CLIMATE ZONE.** A geographical region based on climatic criteria as specified in this code. **CODE OFFICIAL.** The Building Code Enforcement employees, including but not limited to, the *building official*, plan analysts, field inspectors, and other technical staff charged with the administration and enforcement of this code as specifically delegated by the *authority having jurisdiction*. The *code official* is authorized to approve designs, construction, equipment, materials, installations, processes, procedures, practices, and other duties necessary to administer, verify and document compliance with the *Construction Code*, the *Fire Code*, ordinances, and other laws and policies as specifically delegated by the *chief building official, fire chief,* and the *authority having jurisdiction*. **COLLECTION PIPE.** Unpressurized pipe used within the collection system that drains on-site nonpotable water or rainwater to a storage tank by gravity. **[RE] CONDITIONED SPACE.** ~~For energy purposes,~~ An area, room or space that is enclosed within ~~a~~ the building thermal envelope and that is ~~provided with heating and/or cooling equipment~~ directly heated or ~~systems capable of maintaining, through design or heat loss/gain, 50°F (10°C) during the heating season and 85°F (29°C) during the cooling season,~~ cooled or ~~communicates directly with a conditioned space. For mechanical purposes, an area, room~~ that is indirectly heated or ~~space being~~ cooled. Spaces are indirectly heated or cooled where they communicate thru openings with conditioned spaces, where they are separated from conditioned spaces by ~~any equipment~~ uninsulated walls, floors or ceilings or where they contain uninsulated ducts, piping or other sources of heating or ~~appliance.~~ cooling. **CONTINUOUS INSULATION (CI).** Insulating material that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior or exterior or is integral to any opaque surface of the building envelope. **CONSTRUCTION CODE.** Has the meaning ascribed in Section 1-2 of the *City Code*. **CONTROL JOINT.** A one-piece joint made of metal, zinc, or plastic installed in the surface membrane only of plaster or stucco finish in order to allow for stress relief and to reduce minor cracking of the surface. A control joint may not serve as an *expansion joint*. **[RB] CROSS-LAMINATED TIMBER.** A prefabricated engineered wood product consisting of not less than three layers of solid-sawn lumber or	***City of Houston Amendment*** **Analysis:** COH amendments added to correlate with specific terms provided in the *City Code* and to clarify specific terms used in the codes, or to clarify the code intent for the terms defined. **Justification:** Legal has been added this amendment per 10-12-2021 blackline file. This amendment is needed to reference codes and standards adopted by the jurisdiction. Legal has been added this amendment per 10-12-2021 blackline file. Construction Code amendment is needed to reference codes and standards adopted by the jurisdiction.

	structural composite lumber where the adjacent layers are cross-oriented and bonded with structural adhesive to form a solid wood element. **[RE] CURTAIN WALL.** See Section N1101.6 for definition applicable in ~~a cast matrix of concrete or epoxy.~~ Chapter 11. **[RB] DALLE GLASS.** A ~~device that will restrict, retard or direct the flow~~ decorative composite glazing material made of ~~air in any duct, or the products~~ individual pieces of ~~combustion~~ glass that are embedded in a cast matrix of ~~heat-producing equipment, vent connector, vent~~ concrete or ~~chimney.~~ epoxy.	
DANGEROUS – N/A **DUPLEX – N/A**	**DAMPER, VOLUME.** A ~~branch leading from a DWV system terminating at a developed length~~ device that will restrict, retard or direct the flow of ~~2 feet (610 mm)~~ air in any duct, or ~~more. Dead ends shall be prohibited except as an approved part~~ the products of combustion of ~~a rough-in for future connection.~~ heat-producing equipment, vent connector, vent or chimney. **DANGEROUS.** Any building meeting the definition of a dangerous building as defined in Chapter 10, Article IX, of the *City Code* or any building, structure, or portion thereof that meets any of the conditions described below shall be deemed dangerous: 1. The building or structure has collapsed, has partially collapsed, has moved off its foundation, or lacks the necessary support of the ground. 2. There exists a significant risk of collapse, detachment or dislodgement of any portion, member, appurtenance or ornamentation of the building or structure under service loads. **DIRECT SYSTEM.** A solar thermal system in which the gas or liquid in the solar collector loop is not separated from the load. **DRAIN-BACK SYSTEM.** A ~~pipe fitting designed to provide connections in the drainage~~ solar thermal system ~~that have provisions for establishing~~ in which the ~~desired slope~~ fluid in the ~~system. These fittings are made~~ solar collector loop is drained from ~~a variety of both metals and plastics. The methods of coupling provide for required slope in the system (see "Durham fitting").~~ collector into a holding tank under prescribed circumstances. **DRAINAGE FITTING.** A ~~continuous passageway~~ pipe fitting designed to provide connections in the drainage system that have provisions for establishing the ~~transmission of air which,~~ desired slope in ~~addition to ducts, includes duct fittings, dampers, plenums, fans and accessory air-handling equipment~~ the system. These fittings are made from a variety of both metals and ~~appliances. For definition applicable~~ plastics. The methods of coupling provide for required slope in ~~Chapter 11, see Section N1101.9.~~ the system. **DUCT SYSTEM.** A ~~special type of drainage fitting~~ continuous passageway for ~~use in~~ the ~~Durham systems installations~~ transmission of air that, in ~~which the joints are made with recessed and tapered threaded fittings, as opposed~~ addition to ~~bell~~ ducts, includes duct fittings, dampers, plenums, fans and ~~spigot lead/oakum or solvent/cemented or soldered joints. The tapping is at an angle (not 90 degrees) to provide for proper slope in otherwise rigid connections.~~ accessory air-handling equipment and appliances. **DUPLEX.** An individual free-standing structure containing not more than two *dwelling units*, *single-family dwellings*, or households, each containing a separate means of egress.	***City of Houston Amendment*** **Analysis:** COH amendments added to correlate with specific terms provided in the *City Code* and to clarify specific terms used in the codes, or to clarify the code intent for the terms defined. **Justification:** Legal has been added this amendment per 10-12-2021 blackline file. DUPLEX is a new definition needed to clearly differentiate between a single-family residence/a duplex and a townhouse or congregate residence and provides a common term used by industry.

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ELECTRICAL CODE. The *National Electrical Code* promulgated by the National Fire Protection Association, as adopted by this jurisdiction, and the *City of Houston Electrical Code*. See Section R102.9 of this code or Section 101.4.7 of the *Building Code*. **ENERGY CONSERVATION CODE – N/A Reference located in the following definition and in 2012 Building Code:** ***INTERNATIONAL ENERGY CONSERVATION CODE.*** The *City of Houston Residential Energy Conservation Code* or the *City of Houston Commercial Energy Conservation Code*, both based on the *International Energy Conservation Code*, as adopted by the State of Texas, or on an alternate code that has been determined to be more stringent than the *International Energy Conservation Code*, as provided in Chapter 388 of the Texas Health & Safety Code, both as adopted and amended by this jurisdiction. See Section 101.4.6 of the *Building Code*. **EXISTING BUILDING CODE – N/A Code provisions found in Chapter 34 of the Building Code** **EXPANSION JOINT – N/A**	**ELECTRICAL CODE.** The *City of Houston Electrical Code*, as adopted and amended by this *jurisdiction*. **ENERGY CONSERVATION CODE.** The *City of Houston Residential Energy Conservation Code*, as adopted and amended by this *jurisdiction*. **[RB] ENGINEERED WOOD RIM BOARD.** A full-depth structural composite lumber, wood structural panel, structural glued laminated timber or refabricated wood I-joist member designed to transfer horizontal (shear) and vertical (compression) loads, provide attachment for diaphragm sheathing, siding and exterior deck ledgers and provide lateral support at the ends of floor or roof joists or rafters. **[RE] ERI REFERENCE DESIGN.** A version of the rated design that meets the minimum requirements of the 2006 International Energy Conservation Code. **EXISTING BUILDING CODE.** The *City of Houston Existing Building Code* as adopted and amended by this *jurisdiction*. **EXPANSION JOINT.** A two-piece slip joint made of metal, zinc, or plastic installed in a stucco or plaster finish system in which the framing, sheathing, and lath are cut to create a true plane to accommodate expansion and contraction of the system as well as to allow for building movement. An expansion joint may also serve as a *control joint*.	***City of Houston Amendment*** **Analysis:** COH amendments added to correlate with specific terms provided in the *City Code* and to clarify specific terms used in the codes, or to clarify the code intent for the terms defined. **Justification:** This amendment is needed to provide users of the code with references to other codes and standards adopted by the jurisdiction. Added definition of egress court to address specific exterior egress (exit discharge) requirements needed for all building exits and emergency escape and rescue openings for residential structures that contain sleeping rooms. Coordinated with the IBC and IFC. Legal has been added this amendment per 10-12-2021 blackline file.
FIRE CODE. The *City of Houston Fire Code*, as adopted by this jurisdiction. See Section 101.4.5 of the *Building Code*. **FIRE CODE OFFICIAL – N/A Reference Found in Fire Code**	**FACTORY-MADE AIR DUCT.** A listed and ~~combination opaque/glazed doors. For definition applicable~~ labeled duct manufactured in ~~Chapter 11, see Section N1101.9~~ a factory and assembled in the field in accordance with the manufacturer's instructions and conditions of the listing. **[RE] FENESTRATION.** Skylights, roof windows, vertical windows (whether fixed or ~~calcium silicate binder formed by chemical reaction~~ moveable); opaque doors; glazed doors; glass block; and ~~reinforced with discrete organic or inorganic nonasbestos fibers, or both. Additives which enhance manufacturing or product performance are permitted. Fiber-cement siding products have either smooth or textured faces and are intended for exterior wall~~ combination opaque and ~~related applications.~~ glazed doors. **FIBER-CEMENT (BACKERBOARD, SIDING, SOFFIT, TRIM AND UNDERLAYMENT) PRODUCTS.** Manufactured thin section composites of hydraulic cementitious matrices and discrete nonasbestos fibers. **FIRE CODE.** The *City of Houston Fire Code*, as adopted and amended by this *jurisdiction*. **FIRE CODE OFFICIAL.** The fire marshal or a duly authorized representative charged with the administration and enforcement of the *Fire Code*. **FLEXIBLE AIR CONNECTOR.** A ~~continuous run of rectangular treads~~ conduit for transferring air between an air duct or ~~winders~~ plenum and an air terminal unit, an air inlet or ~~combination thereof from one landing to another.~~ an air outlet. Such conduit is limited in its use, length and location. **[RB] FLIGHT.** A continuous run of rectangular treads or winders or combination thereof from one landing to another.	***City of Houston Amendment*** **Analysis:** COH amendments added to correlate with specific terms provided in the *City Code* and to clarify specific terms used in the codes, or to clarify the code intent for the terms defined. **Justification:** This amendment is needed to clarify the origin of applicable code language. Legal has added the term Fire Code Official to coordinate and be consistent with the Fire Code adopted by Houston.

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GRAY WATER. Untreated wastewater that has not come into contact with toilet waste. Gray water includes ~~W~~waste water discharged from lavatories, bathtubs, showers, clothes washers and laundry trays.	**GRAY WATER.** Untreated wastewater that has not come into contact with toilet waste. *Gray water* includes ~~Waste~~ wastewater discharged from lavatories, bathtubs, showers, clothes washers, and laundry trays. **[RB] GUESTROOM.** Any room or rooms used or intended to be used by one or more guests for living or sleeping purposes. **[RB] GYPSUM BOARD.** The generic name for ~~living or sleeping purposes.~~ a family of sheet products consisting of a noncombustible core primarily of gypsum with paper surfacing. Gypsum wallboard, gypsum sheathing, gypsum base for gypsum veneer plaster, exterior gypsum soffit board, predecorated gypsum board and water-resistant gypsum backing board complying with the standards listed in Section R702.3 and Part IX of this code are types of gypsum board. **[RB] GYPSUM PANEL PRODUCT.** The general name for ~~living, sleeping, eating or cooking. Bathrooms, toilet rooms, closets, halls, storage or utility spaces and similar areas are not considered habitable spaces.~~ a family of sheet products consisting essentially of gypsum.	***City of Houston Amendment*** **Analysis:** No changes were made to the previous COH amendment. ***No change to the previous technical code requirements or code intent of this definition.*** **Justification:** This amendment is needed to promote health and safety.
HURRICANE-PRONE REGIONS. Areas vulnerable to hurricanes defined as: **1.** The U.S. Atlantic Ocean and Gulf of Mexico coasts where the ultimate design wind speed, *Vult*, for Risk Category II buildings is greater than 115 mph (51.4 m/s); and **2.** Hawaii, Puerto Rico, Guam, Virgin Islands and American Samoa.	**[RB] HABITABLE SPACE.** A ~~horizontal or sloping rail intended for grasping by the hand~~ space in a building for ~~guidance~~ living, sleeping, eating or cooking. Bathrooms, toilet rooms, closets, halls, storage or ~~support.~~ utility spaces and similar areas are not considered habitable spaces. **[RB] HANDRAIL.** A horizontal or sloping rail intended for grasping by the hand for guidance or support. **[RB] HISTORIC BUILDING.** Buildings that are listed in or eligible for listing in the National Register of Historic Places, or designated as historic under an appropriate state or local law. **[RB] HURRICANE-PRONE REGIONS.** Areas vulnerable to hurricanes, defined as the U.S. Atlantic Ocean and Gulf of Mexico coasts where the ultimate design wind speed, *Vult*, is greater than 115 miles per hour (51 m/s), and Hawaii, Puerto Rico, Guam, Virgin Islands and America Samoa.	***City of Houston Amendment*** **Analysis:** No changes were made to the previous COH amendment. ***No change to the previous technical code requirements or code intent of this definition.*** **Justification:** This amendment is needed to promote health and safety.
INTERNATIONAL BUILDING CODE. The *City of Houston Building Code*, as adopted by this jurisdiction. ***INTERNATIONAL ENERGY CONSERVATION CODE.*** The *City of Houston Residential Energy Conservation Code* or the *City of Houston Commercial Energy Conservation Code,* both based on the *International Energy Conservation Code,* as adopted by the State of Texas, or on an alternate code that has been determined to be more stringent than the *International Energy Conservation Code*, as provided in Chapter 388 of the Texas Health & Safety Code, both as adopted and amended by this jurisdiction. See Section 101.4.6 of the *Building Code*. **INTERNATIONAL EXISTING BUILDING CODE – N/A** ***INTERNATIONAL FIRE CODE.*** The *City of Houston Fire Code*, as adopted by this jurisdiction. See Section 101.4.5 of the *Building Code*. ***INTERNATIONAL FUEL GAS CODE.*** The *City of Houston Plumbing Code*, as adopted by this jurisdiction. See Section 101.4.1 of the *Building Code*.	**INDIRECT SYSTEM.** A solar thermal system in which the gas or liquid in the solar collector loop circulates between the solar collector and a heat exchanger and such gas or liquid is not drained from the system or supplied to the load during normal operation. **INSULATED SIDING.** A type of continuous insulation with manufacturer installed insulating material as an integral part of the cladding product having a minimum R-value of R-2. **INSULATED VINYL SIDING.** A vinyl cladding product with manufacturer installed foam plastic insulating material as an integral part of the cladding product, having a minimum thermal resistance of not less than R-2. **[RB] INSULATING** ~~SHEATHING. An insulating board having~~ **CONCRETE FORM (ICF).** A concrete forming system using stay-in-place forms of rigid foam plastic insulation, a ~~minimum thermal resistance~~ hybrid of ~~R-2~~ cement and foam insulation, a hybrid of ~~the core material. For definition applicable in Chapter 11, see Section N1101.9.~~ cement and wood chips, or other insulating material for constructing cast-in-place concrete walls.	***City of Houston Amendment*** **Analysis:** New model code definitions have been added to address Insulated Vinyl Siding, requirements which are now provided in Sections 703.13 and 1102.1.3 of this code. COH amendments added to correlate with specific terms provided in the *City Code* and to clarify specific terms used in the codes, or to clarify the code intent for the terms defined. **Justification:** This amendment is needed to ensure conformity with state and local government policy.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
COLOR CODE INDEX: **Turquoise** = NEW or Modified Text by ICC in 2015 ~~**Yellow Strike through**~~ = Text Deleted from the Code by COH	**Text Underlined** = COH Amendment added (NEW) **Green Text** = NEW or Modified Text by COH in 2015	**Grey Text** = Previous COH Amendment Brought Forward to 2015 ~~**Strike through**~~ = Text Deleted from the Code by ICC
INTERNATIONAL MECHANICAL CODE. The *City of Houston Mechanical Code*, as adopted by this jurisdiction. See Section R102.10 of this code or Section 101.4.2 of the *Building Code*. ***INTERNATIONAL PLUMBING CODE***. The *City of Houston Plumbing Code*, as adopted by this jurisdiction. See Section R102.11 of this code or Section 101.4.3 of the *Building Code*. ***INTERNATIONAL PROPERTY MAINTENANCE CODE***. Chapter 10 of the *City Code*. **INTERNATIONAL RESIDENTIAL CODE – N/A** **INTERNATIONAL SWIMMING POOL AND SPA CODE – N/A Construction and maintenance provisions located in the Houston Health Code.**	**[RE] INSULATING SHEATHING.** An insulating board having a thermal resistance of not less than R-2 of the core material. **INTERNATIONAL BUILDING CODE.** Any reference herein to the *International Building Code* shall be construed as referring to the *City of Houston Building Code*, as adopted and amended by this *jurisdiction*. **INTERNATIONAL ENERGY CONSERVATION CODE.** Any reference herein to the *International Energy Conservation Code* shall be construed as referring to the *City* of Houston Residential Energy Conservation Code, as adopted and amended by this *jurisdiction*. **INTERNATIONAL EXISTING BUILDING CODE.** Any reference herein to the *International Existing Building Code* shall be construed as referring to the *City of Houston Existing Building Code*, as adopted and amended by this *jurisdiction*. **INTERNATIONAL FIRE CODE.** Any reference herein to the International Fire Code shall be construed as referring to the *City of Houston Fire Code*, as adopted and amended by this *jurisdiction*. **INTERNATIONAL FUEL GAS CODE.** Any reference herein to the *International* Fuel Gas Code shall be construed as referring to the *City of Houston Plumbing Code*, as adopted and amended by this *jurisdiction*. **INTERNATIONAL MECHANICAL CODE.** Any reference herein to the *International Mechanical Code* shall be construed as referring to the *City of Houston Mechanical Code*, as adopted and amended by this *jurisdiction*. **INTERNATIONAL PLUMBING CODE.** Any reference herein to the *International Plumbing Code* shall be construed as referring to the *City of Houston Plumbing Code*, as adopted and amended by this *jurisdiction*. **INTERNATIONAL PROPERTY MAINTENANCE CODE.** Any reference herein to the *International Property Maintenance Code* shall be construed as referring to Chapter 10, Article IX, of the *City Code*, which is also known as the *Houston Building Standards Code*. **INTERNATIONAL RESIDENTIAL CODE.** Any reference herein to the *International Residential Code* shall be construed as referring to the *City of Houston Residential Code*, as adopted and amended by this *jurisdiction*. **INTERNATIONAL SWIMMING POOL AND SPA CODE.** Any reference herein to the International Swimming Pool and Spa Code shall be construed as referring to the *City of Houston Swimming Pool and Spa Code*, as adopted and amended by this *jurisdiction*.	
	[RB] KITCHEN. Kitchen shall mean an area used, or ~~products~~ designated to ~~which have been affixed a label, seal, symbol or other identifying mark of a nationally recognized testing laboratory, inspection agency or other organization concerned with product evaluation that maintains periodic inspection of~~ be used, for the ~~production~~ preparation of ~~the above-labeled items and whose labeling indicates either that the equipment, material or product meets identified standards or has been tested and found suitable for a specified purpose.~~ food.	***City of Houston Amendment*** **Analysis:** ICC added changes to the definitions to correlate with specific terms provided in all code volumes to coordinate those codes, or to clarify the code intent for the terms defined. Updated definition is now in line with the IBC definition. **Justification:** Legal has been added this amendment per 10-12-2021 blackline file to coordinate and be consistent with other codes adopted by Houston.

		This amendment is needed to clarify the origin of applicable code language. New definition for multi-family residential structure to provide clarity on what constitutes a multi-family residence.
	[RB] LABEL. An identification applied on a ~~system~~ product by the manufacturer that contains the name of the manufacturer, the function and performance characteristics of the product or material, and the name and identification of an approved agency and that indicates that the representative sample of ~~repetitive wood~~ the product or ~~cold-formed steel framing members.~~ material has been tested and evaluated by an approved agency. (See also "Manufacturer's designation" and "Mark.") ~~**LISTED.**~~**[RB] LABELED.** *Equipment*, ~~materials,~~ materials or products to which have been affixed a label, seal, symbol or ~~services included in~~ other identifying mark of a ~~list published by an~~ nationally recognized testing laboratory, inspection agency or other organization ~~acceptable to the code official and~~ concerned with product evaluation ~~of products or services~~ that maintains periodic inspection of the production of ~~listed equipment or materials or periodic evaluation of services~~ the labeled items and whose ~~listing states~~ labeling indicates either that the *equipment*, ~~material, product~~ material or ~~service~~ product meets identified standards or has been tested and found suitable for a specified purpose. ~~**LIVE LOADS.** Those loads produced by the use and occupancy~~ **[RB] LIGHT-FRAME CONSTRUCTION. A type** of ~~the building or other structure and do not include~~ construction ~~or environmental loads such as wind load, snow load, rain load, earthquake load, flood load~~ with vertical and horizontal structural elements that are primarily formed by a system of repetitive wood or ~~dead load.~~ cold-formed steel framing members. **[RB] LISTED.** Equipment, materials, products or services included in a list published by an organization acceptable to the code official and concerned with evaluation of products or services that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services and whose listing states either that the equipment, material, product or service meets identified standards or has been tested and found suitable for a specified purpose. **[RB] LIVE LOADS.** Those loads produced by the use and occupancy of the building or other structure and do not include construction or environmental loads such as wind load, snow load, rain load, earthquake load, flood load or dead load.	***City of Houston Amendment*** **Analysis:** ICC added changes to the definitions to correlate with specific terms provided in all code volumes to coordinate those codes, or to clarify the code intent for the terms defined. Updated definition is now in line with the IBC definition. **Justification:** Legal has been added this amendment per 10-12-2021 blackline file to coordinate and be consistent with other codes adopted by Houston. This amendment is needed to clarify the origin of applicable code language. New definition for multi-family residential structure to provide clarity on what constitutes a multi-family residence.
MEANS OF EGRESS – FOUND IN BUILDING CODE ***MECHANICAL CODE***. The *City of Houston Mechanical Code*, as adopted by this jurisdiction. See Section 101.4.2 of the *Building Code*. **MEZZANINE, LOFT**. An intermediate level or levels between the floor and ceiling of any story with an aggregate floor area of not more than one-third of the area of the room or space in which the level or levels are located. **MULTI-FAMILY RESIDENTIAL STRUCTURE – N/A**	**MEANS OF EGRESS SYSTEM.** A continuous and unobstructed path of vertical and horizontal egress travel from any occupied portion of a building or structure to a *public way*. A means of egress system consists of three separate and distinct parts: the *exit access*, the *exit*, and the *exit discharge*. **MECHANICAL CODE.** The *City of Houston Mechanical Code*, as adopted and amended by this *jurisdiction*. **MECHANICAL JOINT.** **1.** A connection between pipes, fittings or pipes and fittings that is not welded, brazed, caulked, soldered, solvent cemented or heat-fused.	***City of Houston Amendment*** **Analysis:** COH amendments added to correlate with specific terms provided in the *City Code* and to clarify specific terms used in the codes, or to clarify the code intent for the terms defined. COH added certain definitions to coordinate and be consistent with other model codes adopted by Houston. The definition for MEZZANINE is modified to delete the term “loft” from the definition because there are no provisions in the code for lofts. Updated definition is now inline with the IBC definition.

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	2. A general form of gas- or liquid-tight connections obtained by the joining of parts through a positive holding mechanical construction such as, but not limited to, flanged, screwed, clamped or flared connections. **MEZZANINE~~, LOFT~~**. An intermediate level or levels between the floor and ceiling of any story ~~with an aggregate floor area of not more than one-third of the area of the room or space in which the level or levels are located~~. **MULTI-FAMILY RESIDENTIAL STRUCTURE.** A structure, including a townhouse structure, that is constructed with three or more attached single-family residences, dwelling units, apartments, or condominiums.	**Justification:** Legal has been added this amendment per 10-12-2021 blackline file to coordinate and be consistent with other codes adopted by Houston. This amendment is needed to clarify the origin of applicable code language. New definition for multi-family residential structure to provide clarity on what constitutes a multi-family residence.
	[RB] NAILABLE SUBSTRATE. A product or material such as framing, sheathing or furring, composed of wood or wood-based materials, or other materials and fasteners providing equivalent fastener withdrawal resistance. **[RB] NOSING.** The leading edge of treads of stairs and of landings at the top of stairway flights.	
ONE- AND TWO-FAMILY DWELLING – N/A	**[RB] OCCUPIED SPACE.** The ~~leading edge~~ total area of ~~treads~~ all buildings or structures on any lot or parcel of ~~stairs and of landings at the top of stairway flights.~~ Ground projected on a horizontal plane, excluding permitted projections as allowed by this code. **OFFSET. A combination** of ~~all buildings or structures on any lot or parcel~~ fittings that makes two changes in direction, bringing one section of ~~ground projected on~~ the pipe out of line and into a ~~horizontal plane, excluding permitted projections as allowed by this code.~~ line parallel with the other section. **ONE- AND TWO-FAMILY DWELLING.** An individual free-standing structure containing not more than two *dwelling units*, also referred to as a *dwelling, duplex* or *single-family dwelling* depending on the number of *dwelling units* within. **ON-SITE NONPOTABLE WATER REUSE SYSTEMS.** Water systems for the collection, treatment, storage, distribution, and reuse of nonpotable water generated on-site, including but not limited to gray water systems. This definition does not include rainwater harvesting systems.	***City of Houston Amendment*** **Analysis:** COH amendment added to correlate with specific terms provided in the *City Code* and to clarify specific terms used in the codes, or to clarify the code intent for the term defined. **Justification:** This amendment is needed to clarify the origin of applicable code language.
PATIO COVER – N/A ***PLUMBING CODE.*** The *City of Houston Plumbing Code*, as adopted by this jurisdiction. See Section 101.4.3 of the *Building Code*. **PLUMBING FIXTURE.** A receptacle or device or appliance that is connected to a water supply system or discharges to a drainage system or both. Such receptacles or devices require a supply of water; or discharge liquid waste or liquid-borne solid waste; or require a supply of water and discharge waste to a drainage system.	**PATIO COVER.** A structure with open or glazed walls that is used for recreational, outdoor living purposes associated with a dwelling unit. **[RB] PERMIT.** An official document or certificate issued by the authority having jurisdiction that authorizes performance of a specified activity. **[RB] PERSON.** An individual, heirs, executors, administrators or assigns, and a firm, partnership or corporation, its or their successors or assigns, or the agent of any of the aforesaid. **[RB] PHOTOVOLTAIC MODULE.** A complete, environmentally protected unit consisting of solar cells, optics and other components, exclusive of a ~~specified activity.~~ tracker, designed to generate DC power where exposed to sunlight. **[RB] PHOTOVOLTAIC PANEL.** A collection of photovoltaic modules mechanically fastened together, wired, and also includes designed to provide a ~~firm, partnership or corporation, its or their successors or assigns, or the agent of any of the aforesaid.~~ field-installable unit.	***City of Houston Amendment*** **Analysis:** New definition addresses Insulated Vinyl Siding which is now addressed in Section 703.13 of this code. COH amendments added to correlate with specific terms provided in the *City Code* and to clarify specific terms used in the codes, or to clarify the code intent for the terms defined. **Justification:** This amendment is needed to clarify the origin of applicable code language.

	[RB] PHOTOVOLTAIC ~~MODULES/SHINGLES.~~ **PANEL SYSTEM.** A ~~roof covering composed of flat-plate~~ system that incorporates discrete photovoltaic ~~modules fabricated~~ panels that convert solar radiation into ~~shingles~~ electricity, including rack support systems. **[RB] PHOTOVOLTAIC SHINGLES.** A roof covering that resembles shingles and that incorporates photovoltaic modules. **[RB] PLASTIC COMPOSITE.** A generic designation that refers to wood-plastic composites and plastic lumber. **PLUMBING CODE.** The *City of Houston Plumbing Code*, as adopted and amended by this *jurisdiction*. **PLUMBING** ~~SYSTEM.~~ **SYSTEMS.** Includes the water ~~supply and~~ distribution ~~pipes,~~ pipes; plumbing ~~fixtures, supports~~ fixtures and ~~appurtenances;~~ traps; water-treating or water-using equipment; soil, waste and vent pipes; ~~sanitary drains~~ and *building* sewers drains; in addition to ~~an approved point of disposal.~~ Their respective connections, devices and appurtenances within a structure or premises; and the water service, building sewer and building storm sewer serving such structure or premises. **POLYPROPYLENE SIDING.** A shaped material, made principally from polypropylene homopolymer, or copolymer, that in some cases contains fillers or reinforcements, that is used to clad exterior walls or buildings. **PORTABLE-FUEL-CELL APPLIANCE.** A fuel cell generator of ~~the roof deck,~~ electricity that is not fixed in place. A portable-fuel-cell appliance utilizes a cord and ~~additional slope has been provided~~ plug connection to ~~ensure drainage of the roof within 48 hours of precipitation.~~ a grid-isolated load and has an integral fuel supply. **[RB] POSITIVE ROOF DRAINAGE.** The drainage condition in which consideration has been made for the loading deflections of the roof deck, and additional slope has been provided to ensure drainage of the roof within 48 hours of precipitation. **PUBLIC WAY.** ~~Any~~ street, alley, or other parcel of land open to the outside air leading to a ~~public~~ street, that has been deeded, dedicated, or otherwise permanently appropriated to the public for public use and ~~that~~ which has a clear width and height of not less than ~~10~~ 20 feet (~~3048~~ 6,096 mm).	
REPAIR. The reconstruction or renewal of any part of an existing building for the purpose of its maintenance. For definition applicable in Chapter 11, see Section N1101.9. **RESIDENTIAL CODE – N/A** **RIGHT-OF-WAY – N/A Reference found in the Building Code**	**[RB] RAMP.** A walking surface that has a ~~building thermal envelope element from one of its bounding surfaces to the other for a unit temperature difference between the two surfaces, under steady-state conditions, per~~ running slope steeper than 1 unit ~~area (h • ft2 • °F/Btu).~~ vertical in 20 units horizontal (5-percent slope). **[RE] RATED DESIGN.** A ~~walking surface that has a running slope steeper than 1 unit vertical in 20 units horizontal (5-percent slope).~~ description of the proposed building, used to determine the energy rating index. **RECLAIMED WATER.** Nonpotable water that has been derived from the treatment of waste water by a facility or system licensed or permitted to produce water meeting the jurisdiction's water requirements for its intended uses. Also known as "Recycled Water."	***City of Houston Amendment*** **Analysis:** COH amendments added to correlate with specific terms provided in the *City Code* and to clarify specific terms used in the codes, or to clarify the code intent for the terms defined. **Justification:** Legal has been added this amendment per 10-12-2021 blackline file to coordinate and be consistent with other codes adopted by Houston.

	[RE] REFLECTIVE DUCT INSULATION. A thermal insulation assembly consisting of one or more surfaces that have an emittance of 0.1 or less, and that bound an enclosed air space or spaces. **[RB] REPAIR.** The reconstruction or renewal of any part of an existing building for the purpose of its maintenance or to correct damage using like for like materials. **RESIDENTIAL CODE.** The *City of Houston Residential Code*, as adopted and amended by this *jurisdiction*. **RIGHT-OF-WAY.** The entire area between the property boundary lines of every way (including but not limited to roads, streets, alleys, highways, boulevards, bridges, tunnels, or similar thoroughfares), whether acquired by purchase, grant, or dedication by the state or federal government, or acceptance by the *authority having jurisdiction* for public use. **[RB] ROOF RECOVER.** The process of installing an additional roof covering over a prepared existing roof covering without removing the existing roof covering. **[RB] ROOF ~~RECOVER.~~** ~~The process~~ **REPAIR.** Reconstruction or renewal of installing any part of an ~~additional roof covering over a prepared~~ existing roof ~~covering without removing~~ for the ~~existing roof covering.~~ purposes of its maintenance. **[RB] ROOF REPLACEMENT.** The process of removing the existing roof ~~of~~ covering, repairing any ~~part of~~ damaged substrate and installing a ~~building.~~ new roof covering. **[RB] ROOFTOP STRUCTURE.** An enclosed structure on or above the roof of any part of a building. **[RE] R-VALUE, THERMAL RESISTANCE.** The inverse of the time rate of heat flow through a building thermal envelope element from one of its bounding surfaces to the other for a unit temperature difference between the two surfaces, under steady state conditions, per unit area (h • ft2 • °F/Btu).	
SIGN CODE – N/A Reference found in the Building Code **SINGLE-FAMILY DWELLING – N/A See Dwelling** **SUBSTANTIAL DAMAGE – N/A** **SWIMMING POOL AND SPA CODE – N/A Reference Health Code and state Adopted Swimming Pool Code**	**SIGN CODE.** The *Houston Sign Code*, which is Chapter 46 of the *Building Code* but is published as a separate document. **SINGLE-FAMILY DWELLING.** An individual freestanding residential structure intended to serve a single family or household as a *dwelling* and/or other uses authorized by the *Building Code* and *Residential Code*. **[RB] SINGLE PLY MEMBRANE.** A ~~vent connecting to the drain pipe through a fitting at an angle less~~ roofing membrane that is field applied using one layer of membrane material (either homogeneous or composite) rather than ~~45 degrees (0.79 rad) to the horizontal.~~ multiple layers. **[RB] SINGLE ~~PLY MEMBRANE. A roofing membrane~~** STATION SMOKE ALARM. An assembly incorporating the detector, control equipment and alarm sounding device in one unit that is ~~field applied using one layer of membrane material (either homogeneous~~ operated from a power supply either in the unit or ~~composite) rather than multiple layers.~~ obtained at the point of installation. **[RB] SHINGLE FASHION.** A method of installing roof or ~~obtained at the point~~ wall coverings, water-resistive barriers, flashing or other building components such that upper layers of material are placed overlapping lower layers of	***City of Houston Amendment*** **Analysis:** COH amendments added to correlate with specific terms provided in the *City Code* and to clarify specific terms used in the codes, or to clarify the code intent for the terms defined. **Justification:** This amendment is needed to clarify the origin of applicable code language. Add new definition to clearly differentiate between a single-family residence, a duplex, and a townhouse. This amendment is needed to clarify the origin of applicable code language.

	~~installation.~~ material to provide drainage and protect against water intrusion at unsealed penetrations and joints or in combination with sealed joints. **[RB] SKYLIGHT AND SLOPED GLAZING.**~~See Section R308.6.1.~~ Glass or other transparent or translucent glazing material installed at a slope of 15 degrees (0.26 rad) or more from vertical. Glazing materials in skylights, including unit skylights, tubular daylighting devices, solariums, sunrooms, roofs and sloped walls are included in this definition. **[RB] SKYLIGHT, UNIT.**~~See Section R308.6.1.~~ A factory assembled, glazed fenestration unit, containing one panel of glazing material, that allows for natural daylighting through an opening in the roof assembly while preserving the weather-resistant barrier of the roof. **[RB] STAIR.** A ~~method~~ **change in elevation, consisting** of ~~venting a fixture~~ one or ~~fixtures through the soil or waste stack without individual fixture vents.~~ more risers. **[RB] STAIRWAY.** One or more flights of stairs, either interior or exterior, with the necessary landings and connecting platforms to form a continuous and uninterrupted passage from one level to another within or ~~more risers.~~ attached to a building, porch or deck. **STAIRWAY, SPIRAL.** A stairway with a plan view of closed circular form and uniform section-shaped treads radiating from a minimum-diameter circle. **SUBSTANTIAL DAMAGE.** A condition where one or both of the following apply: **1.** In any story, the vertical elements of the lateral force-resisting system have suffered damage such that the lateral load-carrying capacity of the structure in any horizontal direction has been reduced by more than 33 percent from its pre-damage condition. **2.** The capacity of any vertical gravity load-carrying component, or any group of such components, that supports more than 30 percent of the total area of the structure's floor(s) and roof(s) has been reduced more than 20 percent from its pre-damage condition and the remaining capacity of such affected elements, with respect to all dead and live loads, is less than 75 percent of that required by this code for new buildings of similar structure, purpose and location. **SWIMMING POOL AND SPA CODE.** The *City of Houston Swimming Pool and Spa Code*, as adopted and amended by this *jurisdiction*.	
TOWNHOUSE. A single-family *dwelling unit* constructed in a group of three or more attached units in which each unit extends from foundation to roof and with a *yard* or public way on at least two sides.	**[RE] THERMAL ~~TRANSMITTANCE, U-FACTOR.~~ RESISTANCE, R-VALUE.** The ~~coefficient~~ inverse of ~~heat transmission (air to air) through a building envelope component or assembly, equal to~~ the time rate of heat flow ~~per unit area and~~ through a body from one of its bounding surfaces to the other for a unit temperature difference between the ~~warm side and cold side air films (Btu/h • ft2• °F) W/(m2• K).~~ two surfaces, under steady state conditions, per unit area (h • ft2• °F/Btu) (m2 • K)/W. **TOWNHOUSE.** A multi-family residential structure constructed in a group of three or more attached single-family *dwelling unit*~~s constructed in a group of three or more attached units~~ in which each unit extends from foundation to roof and with a *yard* or public way on not less than two sides, which may or may not include lot lines or property lines separating each *dwelling unit*.	***City of Houston Amendment*** **Analysis:** COH amendment added to clarify the code intent for the term defined. **Justification:** This amendment is needed to clarify the code intent and origin of applicable code language.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
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	[RB] TRUSS DESIGN DRAWING. The graphic depiction of an individual truss, that describes the design and physical characteristics of the truss. **[RE] TUBULAR DAYLIGHTING DEVICE (TDD).** A nonoperable fenestration unit primarily designed to transmit daylight from a roof surface to an interior ceiling via a tubular conduit. The ~~graphic depiction~~ basic unit consists of an ~~individual truss, which describes the design~~ exterior glazed weathering surface, a light-transmitting tube with a reflective interior surface, and ~~physical characteristics of the truss.~~ an interior-sealing device such as a translucent ceiling panel. The unit may be factory assembled, or field assembled from a manufactured kit.	
UNSAFE – N/A Reference found in the Building Code	**UNSAFE.** Buildings, structures, or equipment that are unsanitary, or that are deficient due to inadequate means of egress facilities, inadequate light, and ventilation, or that constitute a fire hazard, or in which the structure or individual structural members meet the definition of *dangerous*, or that are otherwise hazardous to human life or the public welfare, or that involve illegal or improper occupancy or inadequate maintenance shall be deemed unsafe. A vacant structure that is not secured against entry shall be deemed unsafe.	***City of Houston Amendment*** **Analysis:** COH amendment added to correlate with specific terms provided in the *City Code* and to provide additional clarity in the code for an unsafe building. **Justification:** This amendment is needed to clarify the origin of applicable code language.
WASTE RECEPTOR – N/A Reference found in the Building Code **WIND BORNE DEBRIS REGION.** Areas within hurricane-prone regions located in accordance with one of the following: as designated in accordance with Figure R302.1(4)C.: **1.** Within 1 mile (1.61 km) of the coastal mean high-water line where the ultimate design wind speed, *Vult* is 130 mph (58 m/s) or greater. **2.** In areas where the ultimate design wind speed, *Vult*, is 140 mph (63.6 m/s) or greater; or Hawaii.	**WASTE RECEPTOR.** A floor sink, standpipe, hub drain, or a floor drain that receives the discharge of one or more indirect waste pipes. **WATER DISTRIBUTION SYSTEM.** Piping that conveys water from the service to the plumbing fixtures, appliances, appurtenances, equipment, devices or other systems served, including fittings and control valves. **WET VENT.** A vent that receives the discharge of wastes from other fixtures. **WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM.** An exhaust system, supply system, or combination thereof that ~~also receives~~ is designed to mechanically exchange indoor air for outdoor air where operating continuously or through a programmed intermittent schedule to satisfy the ~~discharge of wastes from other fixtures.~~ whole-house ventilation rate. **[BS] WIND-BORNE DEBRIS REGION.** Areas within hurricane-prone regions located: **1.** Within 1 mile (1.61 km) of the coastal mean high-water line where the ultimate design wind speed, ***Vult*****,** is 130 mph (58 m/s) or greater; or **2.** In areas where the ultimate design wind speed is 140 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 wind-borne debris region shall be based on Figure 1609.3.(1). For *Risk Category* IV buildings and structures and *Risk Category* III health care facilities, the windborne debris region shall be based on Figure 1609.3(2). **[RB] WOOD STRUCTURAL PANEL.** A panel manufactured from ~~the ground to the sky, except where specifically provided by this code, on the lot on which a building is situated.~~ veneers; or wood strands or wafers; bonded together with waterproof synthetic resins or other suitable bonding systems. Examples of wood structural panels are plywood, OSB or composite panels. **[RB] YARD.** An open space, other than a court, unobstructed from the ground to the sky, except where specifically provided by this code, on the lot on which a building is situated.	***City of Houston Amendment*** **Analysis:** A definition of waste receptor was added to the 2015 IRC code to add clarity to the code and its application. Waste receptors are now permitted in bathrooms and closets. *CHANGE SIGNIFICANCE: A definition for "waste receptor" has been added to Chapter 2 to clarify the meaning and give clear direction to the code user. The definition includes only four items—a floor sink, standpipe, hub drain, or a floor drain that receives the discharge of one or more indirect waste pipes. Because they are clearly defined, waste receptors do not require approval by the building official. Floor sinks and floor drains are required to comply with standards. Standpipes and hub drains have specific code requirements. Any other receptor that the designer or installer wants to use will have to be approved under Section R104.11 for alternate materials, methods, and equipment. As defined in Section P2706.1.1, a hub drain is simply a pipe hub or a pipe that extends at least 1 inch above a water-impervious floor, such as concrete. Hub drains that receive only clear water waste and standpipes do not require strainers. There is a low probability that solids will enter these receptors and strainers are not needed. The prohibition against locating waste receptors in bathrooms or closets was deleted. This change recognizes that floor drains, floor sinks or hub drains may be in closets or bathrooms to receive the condensate from air-conditioning units or the discharge from water heater pan drains or temperature and pressure (T&P) relief valves. Standpipes have specifically been permitted in bathrooms beginning with the 2012 IRC.* *The first three sentences of Section P2706.1 have been deleted because they are redundant. Section P2601.2 already covers where waste receptors must be connected, and Section P3201.6 covers the requirement for traps for each fixture. Reference to inaccessible spaces was deleted because all waste receptors must be readily accessible. The term "readily accessible" as defined in Chapter 2 means that access can be gained without the removal of a panel or obstruction. The reference to an unventilated space was unclear and has been deleted.* **Justification:** This amendment is needed to clarify the origin of applicable code language.

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2012 Houston IRC – Part 2—Chapter 3 Building Planning	2015 Houston IRC – Part 2—Chapter 3 Building Planning	Code Analysis

PART 2—Chapter 3 Building Planning

■ ***Chapter 3 Building Planning***

Chapter 3 includes the bulk of the nonstructural provisions, including the location on the lot, fire-resistant construction, light and ventilation, emergency escape and rescue, fire protection, safety glazing, fall protection, and many other provisions aimed at protecting the health, safety, and welfare of the public. In addition to such health and life-safety issues, Chapter 3 provides the overall structural design criteria for residential buildings regulated by the IRC. Section R301 addresses live loads, dead loads, and environmental loads such as wind, seismic, and snow. ■

Table R301.2(1)-Climatic and Geographic Design Criteria; **R301.2**-Wind Design Criteria; **R301.2**-Wind Speed Maps; **Table R301.2(2)**-Component and Cladding Loads; **R301.2.1.1.1**-Sunrooms; **R301.2.1.2**-Protection of Openings in Wind Borne; Debris Regions; **R301.2.1.4**-Wind Exposure; Category; **Table R301.2.1.5.1**-Modifications for Topographic Wind Effects; **R301.2.4**-Floodplain Construction; **R301.3**-Story Height; **R302.1**-Exterior Walls; **R302.2**-Townhouse Separation; **R302.13**-Fire Protection of Floors; **R303.7, R303.8**-Stairway Illumination; **R304.1**-Minimum Habitable Room Area; **R305**-Ceiling Height; **R308.4.2**-Glazing Adjacent to Doors; **R308.4.5**-Glazing and Wet Surfaces; **R308.4.7**-Glazing Adjacent to the Bottom; Stair Landing; **R310**-Emergency Escape and Rescue Openings; **R310.5, R310.6**-Emergency Escape and Rescue Openings; for Additions, Alterations and Repairs; **R311.1**-Means of Egress; **R311.7.3, R311.7.5.1**-Stair Risers; **R311.7.10.1**-Spiral Stairways; **R311.7.11, R311.7.12**-Alternating Tread Devices and Ship Ladders; **R311.8**-Ramps; **R312.1.2**-Guard Height; **R312.2.1**-Window Fall Protection; **R314**-Smoke Alarms; **R315**-Carbon Monoxide Alarms; **R322.1, R322.2**-Flood Hazards; **R322.3**-Coastal High-Hazard Areas; **R325**-Mezzanines

R301.2.1.1 Wind limitations and wind design required. The wind provisions of this code shall not apply to the design of buildings where wind design is required in accordance with Figure R301.2(4)B or where the basic wind speed from Figure R301.2(4)A equals or exceeds 110 miles per hour (49 m/s).

Exceptions:

1. For concrete construction, the wind provisions of this code shall apply in accordance with the limitations of Sections R404 and R611.
2. For structural insulated panels, the wind provisions of this code shall apply in accordance with the limitations of Section R613.

In regions where wind design is required in accordance with Figure R301.2(4)B or where the basic wind speed shown on Figure R301.2(4)A equals or exceeds 110 miles per hour (49 m/s), the design of buildings for wind loads shall be in accordance with one or more of the following methods:

1. AF&PA *Wood Frame Construction Manual* (WFCM); or
2. ICC *Standard for Residential Construction in High-Wind Regions* (ICC 600); or
3. ASCE *Minimum Design Loads for Buildings and Other Structures* (ASCE 7); or
4. AISI *Standard for Cold-Formed Steel Framing—Prescriptive Method For One- and Two-Family Dwellings* (AISI S230); or
5. *International Building Code*; or
6. Appendix L—Conventional Light Frame Wood Construction for High-wind Areas.

The elements of design not addressed by the methods in Items 1 through ~~5~~ 6 shall be in accordance with the provisions of this code. When ASCE 7 or the *International Building Code* is used for the design of the building, the wind speed map and exposure category requirements as specified in ASCE 7 and the *International Building Code* shall be used.

R301.2.1.1 Wind limitations and wind design required. The wind provisions of this code shall not apply to the design of buildings where ~~wind design is required in accordance with Figure R301.2(4)B~~ the Ultimate Design Windspeed, as calculated in accordance with Table R301.2(1), meets or exceeds 140 mph (62.59 m/s)

Exceptions:

1. For concrete construction, the wind provisions of this code shall apply in accordance with the limitations of Sections R404 and R608.
2. For structural insulated panels, the wind provisions of this code shall apply in accordance with the limitations of Section R610.
3. For cold-formed steel light-frame construction, the wind provisions of this code shall apply in accordance with the limitations of Sections R505, R603, and R804.

In regions where ~~wind design is required in accordance with Figure R301.2(4)B,~~ the Ultimate Design Windspeed as determined by Table R301.2(1) meets or exceeds 140 mph (62.59 m/s), the design of buildings for wind loads shall be in accordance with one or more of the following methods:

1. AF&PA *Wood Frame Construction Manual* (WFCM).
2. ICC *Standard for Residential Construction in High-Wind Regions* (ICC 600).
3. ASCE *Minimum Design Loads for Buildings and Other Structures* (ASCE 7).
4. AISI *Standard for Cold-Formed Steel Framing—Prescriptive Method for One- and Two-Family Dwellings* (AISI S230).
5. ~~*International* *Building Code.*~~
6. Appendix L—Conventional Light-Frame Wood Construction for High-wind Areas.

The elements of design not addressed by the methods in Items 1 through ~~5~~ 6 shall be in accordance with the provisions of this code.

Where ASCE 7 or the ~~*International* *Building Code*~~ is used for the design of the building, the wind speed map and exposure category requirements as specified in ASCE 7 and the ~~*International* *Building Code*~~ shall be used.

City of Houston Amendment

Analysis: The previous COH amendment was modified to clarify the code intent. Model code and COH amendment changes clarifies the code language and original model code intent and brings the design windspeed requirements in line with the minimum national standards to promote the intended life-safety within the COH hurricane prone region. The new COH Amendment eliminates previous over burdensome construction requirements. The wind speed construction requirements will now be site specific based on distance to shorelines as intended by nationally recognized minimum model construction code and national engineering practices and standards.

CHANGE SIGNIFICANCE: This code change brings the wind provisions of the International Residential Code (IRC) in line with the 2015 International Building Code (IBC) and ASCE 7-10 standard, Minimum Design Loads for Buildings and Other Structures. For the 2012 IRC, maps based on the ASCE 7-10 ultimate design wind speed data for 3-second gusts were converted to allowable stress design (ASD) values. Meanwhile, wind speed maps in the 2012 IBC and ASCE 7-10 were printed using strength design or "ultimate design" values. This led to confusion among users working with both codes.

A Discussion of Engineering and Wind Speed. The following section describes why wind speeds have changed. Understanding why the values changed is not necessary for use of the IRC, but may be of interest.

The most visible aspect of the wind speed modifications is the change in wind speed maps in the 2015 IRC. The maps were updated to match those adopted in ASCE 7-10. Over the past 10-years, new research indicated that the hurricane wind speeds provided in ASCE 7-05 were too conservative and should be adjusted downward. As more hurricane data became available, it was recognized that substantial improvements could be made to the hurricane model used to develop the wind speed maps. The new data resulted in an improved representation of the hurricane wind field.

Changes to the model include:

- *Refined modeling of sea–land transition and hurricane boundary layer height*
- *New models for hurricane weakening after landfall*
- *Improved statistical modeling for the characteristic controlling wind pressure relationships*

Although the new hurricane hazard model yields hurricane wind speeds lower than those given in earlier code editions, the overall rate of intense storms produced by the new model increased compared to those produced by the hurricane model used to develop previous wind speed maps. This means lower wind speeds over land but more frequent storms. As the wind speed model is developed in part by looking at the statistical chance that a hurricane might occur in a given location, equivalent wind speed values on the map may be slightly higher, the same, or lower than previous values.

In developing new maps, it was decided to use strength-design-based maps in conjunction with a wind load factor of 1.0. For allowable stress design (ASD), the wind load factor would then be reduced to 0.6, and thus footnotes referring to adjustment to a nominal design wind speed include a factor of 0.6.

Factors related to more accurate wind load determination were considered, leading to the decision to move to strength-based ultimate-event wind loads in ASCE 7, the IBC, and the IRC. The most pertinent factor for the IRC is that an ultimate event or strength design wind speed map makes the overall approach for wind consistent with the strength-based seismic design procedures. 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 in engineered design. *As a result of the new strength-based wind speed, new terminology is introduced into the 2015 IRC. The former terms "basic wind speed" and "wind speed" are replaced with "ultimate design wind speed" and labeled V_{ult}. The wind speed that is equivalent to the former "basic wind speed" is now called "nominal design wind speed," V_{asd}. The conversion between the two is,* $$V_{asd} = V_{ult} \times \sqrt{0.6}$$ *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 times the strength level ultimate wind load. Thus,* $$W = V^2$$ $$V_{asd}^2 = 0.6 W_{ult}$$ $$V_{asd}^2 = 0.6 V_{ult}^2$$ $$V_{asd} = \sqrt{0.6} \times V_{ult}$$ *Where,* *W = wind load for IBC and ASCE 7 wind load equations* *V_{asd} = nominal design wind load* *V_{ult} = ultimate design wind load* *Note that the term "basic wind speed" in ASCE 7-10 corresponds to references to wind speed or basic wind speed in the IRC now referred to as nominal design wind speed.* *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 provisions triggered by wind speed are not changed. The terms "ultimate design wind speed" and "nominal design wind speed" are added to help the code user distinguish between them. Table R301.2.1.3 converts the new ultimate design wind speeds to an equivalent nominal design wind speed. Converted wind speeds vary less than 2 miles per hour from former basic wind speeds.* *For example, in a case where the 2012 IRC imposed requirements where the basic wind speed exceeds 85 mph, the 2015 IRC imposes requirements where V_{ult} exceeds 110-mph. Use of Table R301.2.1.3 or the conversion factor of the square root of 0.6 converts the 110-mph wind speed to approximately an 85-mph nominal design wind speed.* *As a second example, in a metal building standard a nominal design wind speed, V_{asd}, of 100-mph corresponds to an ultimate design wind speed, V_{ult}, of 130-mph.* **Justification:** Changes to this amendment clarifies the language and original model code intent and brings the windspeed requirements up to the minimum national standards for each site to promote intended life safety within the COH without requiring over burdensome construction requirements. The wind speed construction requirements will now be site specific based on distance to shorelines as intended by nationally recognized minimum model construction code.
N/A	**R301.2.1.1.1 Sunrooms.** Sunrooms shall comply with AAMA/NPEA/NSA 2100. For the purpose of applying the criteria of AAMA/NPEA/NSA-2100 based on the intended use, sunrooms shall be identified as one of the following categories by the permit applicant, design professional, or the property owner in the construction documents. Component and cladding pressures shall be used for the design of elements that do not qualify as main wind force resisting systems. Main wind force resisting systems	***City of Houston Amendment*** **Analysis:** ***Addition –*** The 2015 International Residential Code now include a prescriptive method for metal framed sunrooms by adding the requirement for the sunrooms to comply with AAMA/NPEA/NSA 2100-12. The installation standard contains prescriptive construction requirements for both habitable and uninhabitable sunrooms.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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Sunroom

pressures shall be used for the design of elements assigned to provide support and stability for the overall sunroom.

Category I: A thermally isolated sunroom with walls that are open or enclosed with insect screening or 0.5 mm (20 mil) maximum thickness plastic film. The space is nonhabitable and unconditioned.

Category II: A thermally isolated sunroom with enclosed walls. The openings are enclosed with translucent or transparent plastic or glass. The space is nonhabitable and unconditioned.

Category III: A thermally isolated sunroom with enclosed walls. The openings are enclosed with translucent or transparent plastic or glass. The sunroom fenestration complies with additional requirements for air infiltration resistance and water-penetration resistance. The space is nonhabitable and unconditioned.

Category IV: A thermally isolated sunroom with enclosed walls. The sunroom is designed to be heated or cooled by a separate temperature control or system and is thermally isolated from the primary structure. The sunroom fenestration complies with additional requirements for water penetration resistance, air infiltration resistance, and thermal performance. The space is nonhabitable and conditioned.

Category V: A sunroom with enclosed walls. The sunroom is designed to be heated or cooled and is open to the main structure. The sunroom fenestration complies with additional requirements for water-penetration resistance, air infiltration resistance, and thermal performance. The space is habitable and conditioned.

CHANGE SIGNIFICANCE: The 2012 International Residential Code defined a sunroom as "A one-story structure attached to a dwelling with a glazing area in excess of 40 percent of the gross area of the structure's exterior walls and roof." These structures were typically constructed in one of two manners:

1. *Using typical wood framing techniques.*
2. *Using a stick system that consists of prefabricated framing of aluminum, fiberglass, wood, or other materials, with glass or opaque wall or roof panels, and steel or aluminum connections.*

Using the 2012 IRC, the first technique was done in accordance with the provisions of the IRC for wood framed construction. There were no provisions for the second method of constructing a sunroom other than by engineering analysis or demonstrating equivalence to the current provisions of the International Residential Code.

By adding reference to the provisions of AAMA/NPEA/NSA 2100-12 Specifications for Sunrooms to the IRC, prescriptive construction is easier. Sunrooms designed and constructed in accordance with AAMA/NPEA/NSA 2100 are required within the standard to meet the structural provisions of the IRC or IBC. In addition, the standard establishes specific requirements for these structures based upon their designated category.

AAMA/NPEA/NSA 2100 was first published in 2002 by the American Architectural Manufacturers Association (AAMA), the National Sunroom Association (NSA), and the National Patio Enclosure Association (NPEA). It is the first U.S. standard for the design and specification of sunrooms. The standard creates five categories of sunrooms based upon intended use of the space. Specific design and performance criteria based on end use were added to the standard.

The standard was later revised to meet the requirements of AAMA/WDMA/CSA 101/I.S.2/A440 for the design, testing, and labeling of windows, glass doors, and skylights, and the foundation requirements of the International Residential Code.

AAMA/NPEA/NSA 2100, and the five categories of sunrooms it establishes, clarifies criteria for sunrooms with regard to egress, natural ventilation, and resistance of the exterior envelop to air leakage and water penetration.

Justification: Model code changes and additions approved at national code development hearings.

R301.2.1.2 Protection of openings. Exterior glazing in buildings located in windborne debris regions shall be protected from windborne debris. Glazed opening protection for windborne debris shall meet the requirements of the Large Missile Test of ASTM E 1996 and ASTM E 1886 referenced therein. The applicable wind zones for establishing misile types in ASTM E 1996 are shown on Figure R301.2(4)C. Garage door glazed opening protection for windborne debris shall meet the requirements of an approved impact-resisting standard or ANSI/DASMA 115.

Exception: Wood structural panels with a minimum thickness of 7/16 inch (11 mm) and a maximum span of 8 feet (2438 mm) shall be permitted for opening protection in one- and two-story buildings. Panels shall be precut and 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 component and cladding loads determined in accordance with either Table R301.2(2) or ASCE 7, with the permanent corrosion-resistant attachment hardware provided and anchors permanently installed on the building. Attachment in accordance with Table R301.2.1.2 is permitted for buildings with a mean roof height of 33 feet (10 058 mm) or less where located in Wind Zones 1 and 2 in accordance with Figure R301.2(4)C.

R301.2.1.2 Protection of openings. Exterior glazing in buildings located in windborne debris regions shall be protected from windborne debris. Glazed opening protection for windborne debris shall meet the requirements of the Large Missile Test of ASTM E 1996 and ASTM E 1886 ~~referenced therein. The applicable wind zones for establishing missile types~~ as modified in ~~ASTM E 1996 are shown on Figure R301.2(4)C.~~ Section 301.2.1.2.1. Garage door glazed opening protection for windborne debris shall meet the requirements of an *approved* impact-resisting standard or ANSI/DASMA 115.

Exception: Wood structural panels with a ~~**minimum**~~ thickness of not less than 7/16 inch (11 mm) and a ~~**minimum**~~ span of not more than 8 feet (2,438 mm) shall be permitted for opening ~~protection in one- and two-story buildings.~~ protection. Panels shall be precut and 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 component and cladding loads determined in accordance with either Table R301.2(2) or ASCE 7, with the permanent corrosion-resistant attachment hardware provided and anchors permanently installed on the building. Attachment in accordance with Table R301.2.1.2 is permitted for buildings with a *mean roof height* of ~~33~~ 45 feet (~~10,058~~ 13,728 mm) or less where ~~located in Wind Zones 1 and 2 in accordance with Figure R301.2(4)C.~~ the ultimate design wind speed, V_{ult} is 180 mph (290 kph) or less.

R301.2.1.2.1 Application of ASTM E 1996. The text of Section 2.2 of ASTM E 1996 shall be substituted as follows:

City of Houston Amendment

Analysis: ***Modification and Addition –*** Requirements for glazed openings to be protected from wind borne debris have been clarified by the addition of a new section detailing changes to the ASTM E 1996 standard.

CHANGE SIGNIFICANCE: In the early development of the legacy high wind standard, SBCCI Deemed to Comply, limits were developed for the geometry of structures covered by the standard. These limits included a mean roof height of 33 feet. The 33-foot height was based on zoning regulations of the time, the referenced wind speed height in the contemporary ASCE wind standard, and the height of most anemometers (wind measuring devices). The legacy standard limited wood buildings to two stories in height. As the standard evolved the height limit was changed from a 33-foot mean roof height to simply two stories.

From a wind perspective, the geometry of the structure matters. Its internal structure of floors and walls affect the resistance of the structure to the wind. The "two-story-only" requirement puts artificial limitations on the use of shutter provisions. The requirement has limited the use of shutter provisions in three-story residential structures built on sloped surfaces or with a first story partially embedded in the ground. SBCCI Deemed to Comply was the precursor to SBCCI Standard for Hurricane Resistant Residential Construction (SSTD-10) and ultimately the ICC Standard for Residential Construction in High Wind Regions (ICC 600). The new height limit of 45 feet allows use of shutter provisions with all three-story buildings.

The final change within this section modifies the ASTM standard, ASTM E 1996, which has wind speeds based on basic wind speed values. The modified values in Section R301.2.1.2.1 replace those values with ultimate design wind speed values for wind zones.

Justification: Model code modification and additions approved at national code development hearings.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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Poly panels protecting windows from wind-borne debris

2.2 ASCE Standard: ASCE 7-10 American Society of Civil Engineers Minimum Design Loads for Buildings and Other Structures

The text of Section 6.2.2 of ASTM E 1996 shall be substituted as follows:

6.2.2 Unless otherwise specified, select the wind zone based on the ultimate design wind speed, V_{ult}, as follows:

6.2.2.1 **Wind Zone 1**–130 mph (58 m/s) ≤ ultimate design wind speed, V_{ult} < 140 mph (63 m/s).

6.2.2.2 **Wind Zone 2**–140 mph (63 m/s) ≤ ultimate design wind speed, V_{ult} < 150 mph (67 m/s) at greater than 1 mile (1.6 km) from the coastline. The coastline shall be measured from the mean high water mark.

6.2.2.3 **Wind Zone 3**–150 mph (67 m/s) ≤ ultimate design wind speed, V_{ult} ≤ 170 mph (76 m/s), or 140 mph (54 m/s) ≤ ultimate design wind speed, V_{ult} ≤ 170 mph (76 m/s) and within 1 mile (1.6 km) of the coastline. The coastline shall be measured from the mean high water mark.

6.2.2.4 **Wind Zone 4**–ultimate design wind speed, V_{ult} > 170 mph (76 m/s).

Wood structural panels protecting windows from wind-borne debris

R301.2.1.3 Wind speed conversion. When referenced documents are based on fastest mile wind speeds, the three-second gust basic wind speeds, *V*3*s*, of Figure R301.2(4) shall be converted to fastest mile wind speeds, *Vfm*, using Table R301.2.1.3.

TABLE R301.2.1.3
EQUIVALENT BASIC WIND SPEEDS [a]

3-second gust, V_{3s}	85	90	100	105	110	120	125	130	140	145	150	160	170
Fastest mile, V_{fm}	71	76	85	90	95	104	109	114	123	128	133	142	152

For SI: 1 mile per hour = 0.447 m/s.
a. Linear interpolation is permitted.

R301.2.1.3 Wind speed conversion. ~~When~~ Where referenced documents are based on ~~fastest mile~~ nominal design wind speeds and do not provide the means for conversion between the ultimate design wind speeds and the nominal design wind speeds, the ~~three-second gust basic~~ ultimate design wind speeds, ~~V_{3s}~~ V_{ult}, of Figure R301.2(4)A shall be converted to ~~fastest mile~~ nominal design wind speeds, ~~V_{fm}~~ V_{asd}, using Table R301.2.1.3.

TABLE R301.2.1.3
WIND SPEED CONVERSIONS [a]

V_{ult}	110	115	120	130	140	150	160	170	180	190	200
V_{asd}	85	89	93	101	108	116	124	132	139	147	155

For SI: 1 mile per hour = 0.447 m/s.
a. Linear interpolation is permitted.

Wood structural panels protecting windows from wind-borne debris

City of Houston Amendment

Analysis: ***Modification*** **–** Ultimate design wind speed values replace basic wind speed values for 3-sec gust wind speeds in Section R301.2.1. A wind speed conversion table has been added to the model code for conversion from ultimate design to nominal design wind speeds.

CHANGE SIGNIFICANCE: This code change brings the wind provisions of the International Residential Code (IRC) in line with the 2015 International Building Code (IBC) and ASCE 7-10 standard, Minimum Design Loads for Buildings and Other Structures. For the 2012 IRC, maps based on the ASCE 7-10 ultimate design wind speed data for 3-second gusts were converted to allowable stress design (ASD) values. Meanwhile, wind speed maps in the 2012 IBC and ASCE 7-10 were printed using strength design or "ultimate design" values. This led to confusion among users working with both codes.

Justification: Model code modification and additions approved at national code development hearings.

R301.2.1.4 Exposure category. For each wind direction considered, an exposure category that adequately reflects the characteristics of ground surface irregularities shall be determined for the site at which the building or

R301.2.1.4 Exposure category. For each wind direction considered, an exposure category that adequately reflects the characteristics of ground surface irregularities shall be determined for the site at which the building or

City of Houston Amendment

Analysis: Wind Exposure Category A is a legacy category that no longer exists in the IBC or ASCE 7, which is the basis standard for determination of wind

surface irregularities shall be determined for the site at which the building or structure is to be constructed. For a site located in the transition zone between categories, the category resulting in the largest wind forces shall apply. Account shall be taken of variations in ground surface roughness that arise from natural topography and vegetation as well as from constructed features. For a site where multiple detached one- and two-family dwellings, townhouses or other structures are to be constructed as part of a subdivision, master-planned community, or otherwise designated as a developed area by the authority having jurisdiction, the exposure category for an individual structure shall be based upon the site conditions that will exist at the time when all adjacent structures on the site have been constructed, provided their construction is expected to begin within one year of the start of construction for the structure for which the exposure category is determined. For any given wind direction, the exposure in which a specific building or other structure is sited shall be assessed as being one of the following categories: **1. Exposure A.** Large city centers with at least 50 percent of the buildings having a height in excess of 70 feet (21 336 mm). Use of this exposure category shall be limited to those areas for which terrain representative of Exposure A prevails in the upwind direction for a distance of at least 0.5 mile (0.8 km) or 10 times the height of the building or other structure, whichever is greater. Possible channeling effects or increased velocity pressures due to the building or structure being located in the wake of adjacent buildings shall be taken into account. **2. Exposure B.** Urban and suburban areas, wooded areas, or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger. Exposure B shall be assumed unless the site meets the definition of another type exposure. **3. Exposure C.** Open terrain with scattered obstructions, including surface undulations or other irregularities, having heights generally less than 30 feet (9144 mm) extending more than 1,500 feet (457 m) from the building site in any quadrant. This exposure shall also apply to any building located within Exposure B type terrain where the building is directly adjacent to open areas of Exposure C type terrain in any quadrant for a distance of more than 600 feet (183 m). This category includes flat, open country and grasslands. **4. Exposure D.** Flat, unobstructed areas exposed to wind flowing over open water for a distance of at least 1 mile (1.61 km). Shorelines in Exposure D include inland waterways, the Great Lakes, and coastal areas of California, Oregon, Washington and Alaska. This exposure shall apply only to those buildings and other structures exposed to the wind coming from over the water. Exposure D extends inland from the shoreline a distance of 1500 feet (457 m) or 10 times the height of the building or structure, whichever is greater.	structure is to be constructed. For a site located in the transition zone between categories, the category resulting in the largest wind forces shall apply. Account shall be taken of variations in ground surface roughness that arise from natural topography and vegetation as well as from constructed features. For a site where multiple detached one- and two-family *dwellings*, *townhouses* or other structures are to be constructed as part of a subdivision or master-planned community, or are otherwise designated as a developed area by the authority having jurisdiction, the exposure category for an individual structure shall be based upon the site conditions that will exist at the time when all adjacent structures on the site have been constructed, provided that their construction is expected to begin within one year of the start of construction for the structure for which the exposure category is determined. For any given wind direction, the exposure in which a specific building or other structure is sited shall be assessed as being one of the following categories: **1. ~~Exposure A.~~** ~~Large city centers with at least 50 percent of the buildings having a height in excess of 70 feet (21 336 mm). Use of this exposure category shall be limited to those areas for which terrain representative of Exposure A prevails in the upwind direction for a distance of at least 0.5 mile (0.8 km) or 10 times the height of the building or other structure, whichever is greater. Possible channeling effects or increased velocity pressures due to the building or structure being located in the wake of adjacent buildings shall be taken into account.~~ **~~2.~~ Exposure B**. Urban and suburban areas, wooded areas or other terrain with numerous closely spaced obstructions having the size of single-family *dwellings* or larger. Exposure B shall be assumed unless the site meets the definition of another type exposure. **~~3~~2. Exposure C.** Open terrain with scattered obstructions, including surface undulations or other irregularities, having heights generally less than 30 feet (9144 mm) extending more than 1,500 feet (457 m) from the building site in any quadrant. This exposure shall also apply to any building located within Exposure B type terrain where the building is directly adjacent to open areas of Exposure C type terrain in any quadrant for a distance of more than 600 feet (183 m). This category includes flat, open country and grasslands. **~~4~~3. Exposure D.** Flat, unobstructed areas exposed to wind flowing over open water, smooth mud flats, salt flats and unbroken ice for a distance of not less than 5,000 feet (1524 m) ~~1 mile (1.61 km). Shorelines in Exposure D include inland waterways, the Great Lakes, and coastal areas of California, Oregon, Washington and Alaska~~. This exposure shall apply only to those buildings and other structures exposed to the wind coming from over the ~~water~~ unobstructed area. Exposure D extends ~~inland~~ downwind from the ~~shoreline~~ edge of the unobstructed area a distance of 600 feet (183 m) ~~1500 feet (457 m)~~ or 20 ~~10~~ times the height of the building or structure, whichever is greater.	exposure categories. In the 2015 IRC, model code Exposure Category A is now deleted. In the 2012 IRC, Wind Exposure Category D applied to regions adjacent to open water in non-hurricane-prone regions. Wind Exposure Category D now applies to open water, mud and salt flats, and unbroken ice fields. Exposure Category D also applies in hurricane-prone regions to residences on or near the ocean shore. *CHANGE SIGNIFICANCE: Wind Exposure Category A is a legacy category that no longer exists in the IBC and ASCE 7, which is the basis for determination of wind exposure categories. Exposure A is deleted in the 2015 IRC. Wind Exposure Category A included residential-height buildings surrounded by taller buildings in an urban environment. Because buildings surrounded by taller buildings may be subjected to increased wind speeds and gusting of winds due to the tunnel effect of taller buildings, the category as a minimal category was dropped from ASCE 7 and the IBC. Buildings in these areas may be required to have wind tunnel testing or have additional factors increasing the basic wind speed applied to them. The category remained in the IRC through the 2012 edition.* *Wind Exposure Category D has been updated to match the standard that is the basis for wind exposures, the Minimum Design Loads for Buildings and Other Structures, ASCE/SEI 7-10. Due to research in wind speeds at the water surface during hurricanes and other storm events, it is now appropriate to use Exposure D for hurricane-affected coastlines and for large, unusually flat regions that do not have open water nearby. Previously, high winds across the ocean's surface were assumed to create large waves (fetch). Recent research has shown that wave heights directly below hurricanes are dampened, causing the ocean's surface to be relatively smooth. Exposure D is applied when an area is unobstructed and the surface is smooth. This category has always been used for non-hurricane-prone coastlines. With evidence that a hurricane does not significantly roughen the ocean surface, Exposure Category D becomes the more appropriate category along hurricane-prone coastlines as well.* *Because Exposure Category D applies to unobstructed areas and smooth surfaces, the category is now used for areas that are salt flats, marshes, and unbroken ice. These areas have little elevation to break up winds before they reach residential construction. Because winds take some time to slow down due to a new obstruction, regions that would otherwise be in Wind Exposure Category B or C that are within 600 feet of the boundary of a body of water or ice, a marsh, or a salt flat also have Exposure Category D requirements applied to them.* *This change to the exposure categories brings the IRC in line with the IBC and industry standards. The 2012 IRC definition for Wind Exposure Category D did not match the definition in the 2012 IBC or ASCE 7-10. This code change incorporates the language of ASCE 7-10 Section 26.7.3 into the IRC. For more information on recent high wind research, read ASCE 7-10 commentary section C26.7.* **Justification:** The committee recommends not keeping this amendment, as it had the effect of reducing fire safety.
R301.2.1.5 Topographic wind effects. In areas designated in Table R301.2(1) as having local historical data documenting structural damage to buildings caused by wind speed-up at isolated hills, ridges and escarpments that are abrupt changes from the general topography of the area, topographic wind effects shall be considered in the design of the building in accordance with Section R301.2.1.5.1 or in accordance with the provisions of ASCE 7. See Figure R301.2.1.5.1(1) for topographic features for wind speed-up effect.	**R301.2.1.5 Topographic wind effects.** In areas designated in Table R301.2(1) as having local historical data documenting structural damage to buildings caused by wind speed-up at isolated hills, ridges and escarpments that are abrupt changes from the general topography of the area, topographic wind effects shall be considered in the design of the building in accordance with Section R301.2.1.5.1 or in accordance with the provisions of ASCE 7. See Figure R301.2.1.5.1(1) for topographic features for wind speed-up effect.	***City of Houston Amendment*** **Analysis:** ***Modification –*** Minor editorial changes to the model code to include the metric equivalent to the dimensions specified in this section. ***No change to the previous technical code requirements or code intent of this section.*** **Justification:** These model code changes were approved at the national code development hearings.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

COLOR CODE INDEX: Turquoise = NEW or Modified Text by ICC in 2015 | Yellow Strike through = Text Deleted from the Code by COH | Text Underlined = COH Amendment added (NEW) | Green Text = NEW or Modified Text by COH in 2015 | Grey Text = Previous COH Amendment Brought Forward to 2015 | Strike through = Text Deleted from the Code by ICC

In these designated areas, topographic wind effects shall apply only to buildings sited on the top half of an isolated hill, ridge or escarpment where all of the following conditions exist:

1. The average slope of the top half of the hill, ridge or escarpment is 10 percent or greater.
2. The hill, ridge or escarpment is 60 feet (18,288 mm) or greater in height for Exposure B, 30 feet (9,144 mm) or greater in height for Exposure C, and 15 feet (4,572 mm) or greater in height for Exposure D.
3. The hill, ridge or escarpment is isolated or unobstructed by other topographic features of similar height in the upwind direction for a distance measured from its high point of 100 times its height or 2 miles, whichever is less. See Figure R301.2.1.5.1(3) for upwind obstruction.
4. The hill, ridge or escarpment protrudes by a factor of two or more above the height of other upwind topographic features located in any quadrant within a radius of 2 miles measured from its high point.

In these designated areas, topographic wind effects shall apply only to buildings sited on the top half of an isolated hill, ridge or escarpment where all of the following conditions exist:

1. The average slope of the top half of the hill, ridge or escarpment is 10 percent or greater.
2. The hill, ridge or escarpment is 60 feet (18,288 mm) or greater in height for Exposure B, 30 feet (9,144 mm) or greater in height for Exposure C, and 15 feet (4,572 mm) or greater in height for Exposure D.
3. The hill, ridge or escarpment is isolated or unobstructed by other topographic features of similar height in the upwind direction for a distance measured from its high point of 100 times its height or 2 miles (3.2 km), whichever is less. See Figure R301.2.1.5.1(3) for upwind obstruction.
4. The hill, ridge or escarpment protrudes by a factor of two or more above the height of other upwind topographic features located in any quadrant within a radius of 2 miles (3.2 km) measured from its high point.

TABLE R301.2.1.5.1 Ultimate Design wind Speed Modification for Topographic wind Effect [a, b]

BASIC WIND SPEED FROM FIGURE R301.2(4) (mph)	AVERAGE SLOPE OF THE TOP HALF OF HILL, RIDGE OR ESCARPMENT (percent)						
	0.10	0.125	0.15	0.175	0.20	0.23	0.25 or greater
	Required basic wind speed-up, modified for topographic wind speed up (mph)						
85	100	100	100	110	110	110	120
90	100	100	110	110	120	120	120
100	110	120	120	130	130	130	140
110	120	130	130	140	140	150	150
120	140	140	150	150	N/A	N/A	N/A
130	150	N/A	N/A	N/A	N/A	N/A	N/A

For SI: 1 mile per hour = 0.447 m/s.

TABLE R301.2.1.5.1 Ultimate Design wind Speed Modification for Topographic wind Effect [a, b]

TABLE R301.2.1.5.1 Ultimate Design Wind Speed Modification for Topographic Wind Effect[a,b]

Ultimate Design Wind Speed from Figure R301.2(4)A	Average Slope of the Top Half of Hill, Ridge, or Escarpment (percent)						
	0.10	0.125	0.15	0.175	0.20	0.23	0.25
	Required Ultimate Design Wind Speed-up, Modified for Topographic Wind Speed Up (mph)						
110	132	137	142	147	152	158	162
115	138	143	148	154	159	165	169
120	144	149	155	160	166	172	176
130	156	162	168	174	179	N/A	N/A
140	168	174	181	N/A	N/A	N/A	N/A
150	180	N/A	N/A	N/A	N/A	N/A	N/A

a. Table applies to a feature height of 500 feet or less and dwellings sited a distance equal or greater than half the feature height.
b. Where the ultimate design wind speed as modified by Table R301.2.1.5.1 equals or exceeds 140 mph, the building shall be considered as "wind design required" in accordance with Section R301.2.1.1.

(Deleted text not shown for clarity.)

City of Houston Amendment

Analysis: ***Modification*** **–** Table R301.2.1.5.1, Ultimate Design Wind Speed Modification for Topographic Wind Effect, is updated for the change in wind speed values. The table gives minimum ultimate design wind speed values depending upon the slope of the upper portion of the ridge, hill, or escarpment.

CHANGE SIGNIFICANCE: Table R301.2.1.5.1 gives the required ultimate design wind speed for a building on or above a slope. The value is determined by the slope of the upper portion of a ridge, hill, or escarpment. A new footnote is provided as reference for topographic wind effects making the site a "wind design required" region and requiring use of an alternate standard (ICC-600, WFCM, AISI 230, IBC) for wind design.

The table for modifications due to topographic wind speed effects is based on the concept that wind speed increases as air is compressed when moving upward over a hill or ridge. The process to determine wind speedup due to topographic effects is complex and requires wind analysis and design. IRC Table R301.2.1.5.1 attempts to simplify this design in a table for slopes of 10 to 25 percent. Note that the table lists percentages as decimal values.

Justification: These model code changes were approved at the national code development hearings.

R301.2.4 Floodplain construction. Buildings and structures constructed in whole or in part in flood hazard areas (including A or V Zones) as established in Table R301.2(1) shall be designed and constructed in accordance with Section R322. Buildings and structures located in whole or in part in identified floodways shall be designed and constructed in accordance with ASCE 24.

R301.2.4.1 Alternative provisions. As an alternative to the requirements in Section R322.3 for buildings and structures located in whole or in part in coastal high-hazard areas (V Zones) and coastal A Zones, if delineated, ASCE 24 is permitted subject to the limitations of this code and the limitations therein.

R301.2.4 Floodplain construction. Buildings and structures constructed in whole or in part in flood hazard areas (including A or V Zones) as established in Table R301.2(1), and substantial improvement and restoration of substantial damage of buildings and structures in flood hazard areas, shall be designed and constructed in accordance with Section R322. Buildings and structures that are located in more than one flood hazard area shall comply with the provisions associated with the most restrictive flood hazard area. Buildings and structures located in whole or in part in identified floodways shall be designed and constructed in accordance with ASCE 24.

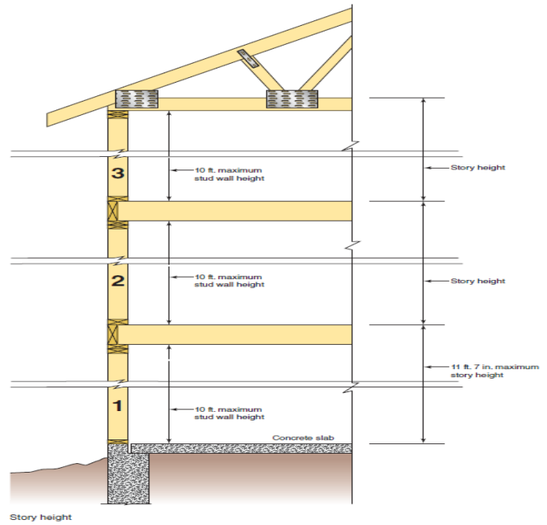
R301.2.4.1 Alternative provisions. As an alternative to the requirements in Section R322, ~~R322.3 for buildings and structures located in whole or in part in coastal high-hazard areas (V Zones) and Coastal A Zones, if delineated,~~ ASCE 24 is permitted subject to the limitations of this code and the limitations therein.

City of Houston Amendment

Analysis: ***Modification*** **–** Buildings located in a flood hazard area must comply with the provisions for the most restrictive flood hazard area and may use ASCE 24 for design.

CHANGE SIGNIFICANCE: ASCE/SEI 24, Flood Resistant Design and Construction, provides an alternative design procedure for buildings and structures in flood hazard areas. There are many flood hazard areas where the builder, designer, or building official may deem it appropriate to use an engineered foundation, such as along riverine waterways and some coastal areas (inland of Zone V) where flood depths are significant and dwellings would need very tall foundations. Design may be needed in riverine floodplains where flood velocities are very fast as well. ASCE 24 provides assistance for design of these foundations.

Another situation where use of ASCE 24 is appropriate is with dwellings in flood hazard areas on alluvial fans. The IRC does not contain specific provisions for alluvial fans. Specifying ASCE 24 as an alternative allows its use where prescriptive provisions of the IRC do not account for known flood risks.

		Design of buildings located in two flood hazard areas is clarified. Where a building is affected by more than one flood hazard, the structure must comply with the more restrictive provisions that take into account flood loads and conditions of the area. For example, a dwelling that straddles a line that separates Zone A from Zone V must comply with the requirements for Zone V. Section R301.2.4 applies to existing dwellings as well as new dwellings. The flood provisions apply to substantial improvement And substantial damage of existing dwellings. **Justification:** These model code changes were approved at the national code development hearings.
R301.3 Story height. The wind and seismic provisions of this code shall apply to buildings with story heights not exceeding the following: **1.** For wood wall framing, the laterally unsupported bearing wall stud height permitted by Table R602.3(5) plus a height of floor framing not to exceed 16 inches (406 mm). **Exception:** For wood-framed wall buildings with bracing in accordance with Tables R602.10.3(1) and R602.10.3(3), the wall stud clear height used to determine the maximum permitted *story height* may be increased to 12 feet (3658 mm) without requiring an engineered design for the building wind and seismic force-resisting systems provided that the length of bracing required by Table R602.10.3(1) is increased by multiplying by a factor of 1.10 and the length of bracing required by Table R602.10.3(3) is increased by multiplying by a factor of 1.20. Wall studs are still subject to the requirements of this section. **2.** For steel wall framing, a stud height of 10 feet (3048 mm), plus a height of floor framing not to exceed 16 inches (406 mm). **3.** For masonry walls, a maximum bearing wall clear height of 12 feet (3658 mm) plus a height of floor framing not to exceed 16 inches (406 mm). **Exception:** An additional 8 feet (2438 mm) is permitted for gable end walls. **4.** For insulating concrete form walls, the maximum bearing wall height per *story* as permitted by Section R611 tables plus a height of floor framing not to exceed 16 inches (406 mm). **5.** For structural insulated panel (SIP) walls, the maximum bearing wall height per *story* as permitted by Section R613 tables shall not exceed 10 feet (3048 mm) plus a height of floor framing not to exceed 16 inches (406 mm). Individual walls or walls studs shall be permitted to exceed these limits as permitted by Chapter 6 provisions, provided *story heights* are not exceeded. Floor framing height shall be permitted to exceed these limits provided the *story height* does not exceed 11 feet 7 inches (3531 mm). An engineered design shall be provided for the wall or wall framing members when they exceed the limits of Chapter 6. Where the *story height* limits of this section are exceeded, the design of the building, or the noncompliant portions thereof, to resist wind and seismic loads shall be in accordance with the *International Building Code*.	**R301.3 Story height.** The wind and seismic provisions of this code shall apply to buildings with story heights not exceeding the following: **1.** For wood wall framing, the story height shall not exceed 11 feet 7 inches (3,531 mm) and the laterally unsupported bearing wall stud height permitted by Table R602.3(5) ~~plus a height of floor framing not to exceed 16 inches (406 mm)~~. ~~**Exception:** For wood-framed wall buildings with bracing in accordance with Tables R602.10.3(1) and R602.10.3(3), the wall stud clear height used to determine the maximum permitted story height may be increased to 12 feet (3658 mm) without requiring an engineered design for the building wind and seismic force-resisting systems provided that the length of bracing required by Table R602.10.3(1) is increased by multiplying by a factor of 1.10 and the length of bracing required by Table R602.10.3(3) is increased by multiplying by a factor of 1.20. Wall studs are still subject to the requirements of this section.~~ **2.** For cold-formed steel wall framing, ~~a~~ the story height shall be not more than 11 feet 7 inches (3,531 mm) and the unsupported bearing wall stud height ~~of~~ shall be not more than 10 feet (3,048 mm)~~, plus a height of floor framing not to exceed 16 inches (406 mm)~~. **3.** For masonry walls, ~~a maximum~~ the story height shall be not more than 13 feet 7 inches (4,140 mm) and the bearing wall clear height ~~of~~ shall be not greater than 12 feet (3,658 mm) ~~plus a height of floor framing not to exceed 16 inches (406 mm)~~. **Exception:** An additional 8 feet (2,438 mm) of bearing wall clear height is permitted for gable end walls. **4.** For insulating concrete form walls, the maximum ~~bearing~~ story height shall not exceed 11 feet 7 inches (3,531 mm) and the maximum unsupported wall height per story as permitted by Section ~~R611~~ R608 tables ~~plus a height of floor framing~~ shall not ~~to~~ exceed ~~16 inches (406~~ 10 feet (3,048 mm). **5.** For structural insulated panel (SIP) walls, the ~~maximum~~ story height shall be not greater than 11 feet 7 inches (3,531 mm) and the bearing wall height per story as permitted by Section ~~R613~~ R610 tables shall not exceed 10 feet (3,048 ~~mm) plus a height of floor framing not to exceed 16 inches (406~~ mm). Individual walls or ~~walls~~ wall studs shall be permitted to exceed these limits as permitted by Chapter 6 provisions, provided that story heights are not exceeded. ~~Floor framing height shall be permitted to exceed these limits provided the story height does not exceed 11 feet 7 inches (3,531 mm).~~ An engineered design shall be provided for the wall or wall framing members ~~when they exceed~~ where the limits of Chapter 6 are exceeded. Where the story height limits of this section are exceeded, the design of the building, or the noncompliant portions thereof, to resist wind and seismic loads shall be in accordance with the International Building Code.	***City of Houston Amendment*** **Analysis:** ***Modification*** **–** Buildings located in a flood hazard area must comply with the provisions for the most restrictive flood hazard area and may use ASCE 24 for design.  *CHANGE SIGNIFICANCE: This code change revises the story height limits. The 2009 IRC introduced the 11 feet 7 inches story height limit as an alternative to limiting the floor framing height to 16 inches when wall stud heights were 10 feet 0 inches. The exception was added to a paragraph following the five individual limits for wall materials. This has led to conflict with the Chapter 6 provisions limiting stud size and height and with the wall bracing section. This code change moves the story height limit to each of the individual material sections and coordinates the height limit with the material-specific provisions.* *The 2012 IRC exception for wood wall studs in Section R301.3 is deleted, as it is redundant with the following provisions of Chapter 6:* *1. Table R602.3(5) covers when studs in non-bearing walls can exceed 10 feet.* *2. Section R602.3.1 provides limited cases for studs in bearing walls exceeding 10 feet in height.* *3. The wall bracing section provides adjustments to wind and seismic bracing amounts for heights up to 12 feet.* *This change clarifies the intent that stud heights over 10 feet require engineered design or use of an alternate standard for gravity loads. For determination of wall bracing length, use of the wall bracing provisions permits walls up to 12 feet tall. The wall bracing section does not address structural concerns due to gravity loads resulting from an overall increase in story height. The wall bracing section only applies to in-plane lateral loads. For out-of-plane lateral loads, the limited conditions in Section R602.3.1 allow studs greater than 10 feet in height supporting roof loads.* **Justification:** These model code changes were approved at the national code development hearings.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

COLOR CODE INDEX: **Turquoise** = NEW or Modified Text by ICC in 2015 | **Yellow Strike through** = Text Deleted from the Code by COH | **Text Underlined** = COH Amendment added (NEW) | **Green Text** = NEW or Modified Text by COH in 2015 | **Grey Text** = Previous COH Amendment Brought Forward to 2015 | **Strike through** = Text Deleted from the Code by ICC

TABLE R301.2(1)
CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA

GROUND SNOW LOAD	WIND DESIGN		SEISMIC DESIGN CATEGORY[f]	SUBJECT TO DAMAGE FROM			WINTER DESIGN TEMP[e]	ICE BARRIER UNDERLAYMENT REQUIRED[h]	FLOOD HAZARDS[g]	AIR FREEZING INDEX[i]	MEAN ANNUAL TEMP[j]
	Speed[d] (mph)	Topographic effects[k]		Weathering[a]	Frost line depth[b]	Termite c					
0	110	No	A	Negligible	6 inches	Very Heavy	28	No	Reference Ch. 19 of *City Code*	(>0-1000)	70

For SI: 1 pound per square foot= 0.0479 kPa, 1 mile per hour = 0.447 m/s.

a. Weathering may require a higher strength concrete or grade of masonry than necessary to satisfy the structural requirements of this code. The weathering column shall be filled in with the weathering index (i.e., "negligible," "moderate" or "severe") for concrete as determined from the Weathering Probability Map [Figure R301.2(3)]. The grade of masonry units shall be determined from ASTM C 34, C 55, C 62, C 73, C 90, C 129, C 145, C 216, or C 652.

b. The frost line depth may require deeper footings than indicated in Figure R403.1 (1). The jurisdiction shall fill in the frost line depth column with the minimum depth of footing below finish grade.

c. The jurisdiction shall fill in this part of the table to indicate the need for protection depending on whether there has been a history of local subterranean termite damage.

d. The jurisdiction shall fill in this part of the table with the wind speed from the basic wind speed map [Figure R301.2 (4)A]. Wind exposure category shall be determined on a site-specific basis in accordance with Section R301.2.1.4.

e. The outdoor design dry-bulb temperature shall be selected from the columns of 97½-percent values for winter from Appendix D of the ~~*International* *Plumbing Code*~~. Deviations from the Appendix D temperatures shall be permitted to reflect local climates or local weather experience as determined by the *building official*.

f. The jurisdiction shall fill in this part of the table with the seismic design category determined from Section R301.2.2.1.

g. The jurisdiction shall fill in this part of the table with (a) the date of the jurisdiction's entry into the National Flood Insurance Program (date of adoption of the first code or ordinance for management of flood hazard areas), (b) the date(s) of the Flood Insurance Study and (c) the panel numbers and dates of all currently effective FIRMs and FBFMs or other flood hazard map adopted by the authority having jurisdiction, as amended.

h. In accordance with Sections R905.2.7.1, R905.4.3.1, R905.5.3.1, R905.6.3.1, R905.7.3.1 and R905.8.3.1, where there has been a history of local damage from the effects of ice damming, the jurisdiction shall fill in this part of the table with "YES." Otherwise, the jurisdiction shall fill in this part of the table with "NO."

i. The jurisdiction shall fill in this part of the table with the 100-year return period air freezing index (BF-days) from Figure R403.3(2) or from the 100-year (99 percent) value on the National Climatic Data Center data table "Air Freezing Index-USA Method (Base 32°F)" at www.ncdc.noaa.gov/fpsf.html.

j. The jurisdiction shall fill in this part of the table with the mean annual temperature from the National Climatic Data Center data table "Air Freezing Index-USA Method (Base 32°F)" at www.ncdc.noaa.gov/fpsf.html.

k. In accordance with Section R301.2.1.5, where there is local historical data documenting structural damage to buildings due to topographic wind speed-up effects, the jurisdiction shall fill in this part of the table with "YES." Otherwise, the jurisdiction shall indicate "NO" in this part of the table.

TABLE R301.2(1)
CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA

GROUND SNOW LOAD	WIND DESIGN				SEISMIC DESIGN CATEGORY[f]	SUBJECT TO DAMAGE FROM			WINTER DESIGN TEMP[e]	ICE BARRIER UNDERLAYMENT REQUIRED[h]	FLOOD HAZARDS[g]	AIR FREEZING INDEX[i]	MEA ANN TEM
	Speed[d] (mph)	Topographic effects[k]	Special wind Region[l]	Wind-borne Debris Zone[m]		Weathering a	Frost line depth[b]	Termite c					
0	See EN n	NO	NO	Zone 1 or 2[n]	A	Negligible	6 inches	Very Heavy	28	NO	Reference Ch. 19 of *City Code*	(>1500)	68

For SI: 1 pound per square foot= 0.0479 kPa, 1 mile per hour= 0.447 m/s.

{EDITORIAL NOTE: FOOTNOTES NOT SHOWN REMAIN AS SET FORTH IN 2015 IRC.}

l. In accordance with Figure R301.2(4)A, where there is local historical data documenting unusual wind conditions, the jurisdiction shall fill in this part of the table with "YES" and identify any specific requirements. Otherwise, the jurisdiction shall indicate "NO" in this part of the table.

m. In accordance with Section R301.2.1.2.1, the jurisdiction shall indicate the windborne debris wind zone(s). Otherwise, the jurisdiction shall indicate "NO" in this part of the table.

n. Ultimate Design Windspeed shall be determined by entering the physical address of the property where the building will be constructed into the ASCE 7 Windspeed. Website: **http://windspeed.atcouncil.org/.** Buildings shall be considered Risk Category II. A copy of the windspeed printout from the website shall be attached to the plans for verification.

City of Houston Amendment

Analysis: The existing table in the model code includes two new categories and the previous COH amendment is expanded to include the new information based on the current code requirements. Wind Speed design requirements are now site specific and a printout from the following website for the project address showing the design requirements for the site must be attached to the plans. *http://windspeed.atcouncil.org/*

CHANGE SIGNIFICANCE: The special wind regions and wind design required regions are shown on a single map for the continental United States in Figure R301.2(4) B. For wind borne debris zones, attempting to interpret wind speed from Figure R301.2(4)B near locations where the contour lines occur can be difficult and may lead to misapplication. The contour lines do not follow county lines or borders. Identification of zones where wind borne debris requirements are applied should be provided by the local jurisdiction to ensure that provisions are applied correctly.

Although the special wind region and wind-borne debris requirements do not apply to most of the United States, when applicable they can have a major impact on the design and construction of residential structures. It is important that the designer determine when a project is in one of these regions by contacting the building department.

Justification: Footnote "n" was added by to allow for accurate discovery of actual wind zone for a specific address. Figure R301.2(4)A in the model code print shows several wind speed zones over the Houston area, but it is not clear enough to show where the boundaries are located.

TABLE R301.2(2)

TABLE R301.2(2)

(*Table values not shown for brevity and clarity*)

TABLE R301.2(2) Component and Cladding Loads for a Building with a Mean Roof Height of 30 Feet Located in Exposure B (ASD)(psf)[a, b, c, d, e]

Zone	Effective Wind Area (feet²)	Ultimate Design Wind Speed, V_{ULT} (mph)								
		110	115	120	130	140	150	160	170	180
Roof 0 to 7 degrees										
Roof >7 to 27 degrees										
Roof >27 to 45 degrees										
Wall										

City of Houston Amendment

Analysis: ***Modification -*** The component and cladding table uses ultimate design wind speeds in place of former basic wind speeds as limits for loads. Roof slopes are divided into new categories for determining component and cladding loads.

CHANGE SIGNIFICANCE: This code change brings the wind provisions of the International Residential Code in line with the 2015 International Building Code (IBC) and Minimum Design Loads for Buildings and Other Structures (ASCE/SEI 7-10). For more information about the change in wind speed values, see significant change R301.2, Wind Speed Design Criteria. Values in wind speed maps have changed, but component and cladding loads converted to allowable stress design values remain the same.

The component and cladding pressure table is set up using ultimate design wind speed, but values printed in the table are listed as allowable stress design values. In other words, the listed pressures incorporate a 0.6 multiplier on the wind loads for allowable stress design load combinations shown in Section 1605.3 of the International Building Code. This is done to allow simple adaptation of existing designs, construction documents, and guidelines to the 2015 IRC, as loads and pressures are comparable to previous editions of the IRC. Residential product manufacturers typically still use allowable stress design values on their packaging and installation instructions. This code change also divides roof slopes into new categories for

Analysis based on the following Files:

2021-1037 Exhibit G-1 2015 IRC Final-MH
2015 IRC

2012 IRC, Print 13
2012 Houston Amendments-ALL

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

COLOR CODE INDEX: Turquoise = NEW or Modified Text by ICC in 2015; ~~Yellow Strike through~~ = Text Deleted from the Code by COH; Text Underlined = COH Amendment added (NEW); Green Text = NEW or Modified Text by COH in 2015; Grey Text = Previous COH Amendment Brought Forward to 2015; ~~Strike through~~ = Text Deleted from the Code by ICC

TABLE R301.2(2)
COMPONENT AND CLADDING LOADS FOR A BUILDING WITH A MEAN ROOF HEIGHT OF 30 FEET LOCATED IN EXPOSURE B (psf)

ZONE	EFFECTIVE WIND AREA (feet²)	BASIC WIND SPEED (mph-3-second gust) 85		90		100		105		110		120		125		130		140		145		150		170	
Roof > 0 to 7 degrees	1	10	10.0	13.0	10.0	14.6	10.0	18.0	10.0	19.8	10.0	21.8	10.5	25.9	11.4	28.1	12.4	30.4	14.3	35.3	15.4	37.8	16.5	40.5	21.1	52.0
	1	20	10.0	12.7	10.0	14.2	10.0	17.5	10.0	19.3	10.0	21.2	10.0	25.2	10.7	27.4	11.6	29.6	13.4	34.4	14.4	36.9	15.4	39.4	19.8	50.7
	1	50	10.0	12.2	10.0	13.7	10.0	16.9	10.0	18.7	10.0	20.5	10.0	24.4	10.0	26.4	10.6	28.6	12.3	33.2	13.1	35.6	14.1	38.1	18.1	48.9
	1	100	10.0	11.9	10.0	13.3	10.0	16.5	10.0	18.2	10.0	19.9	10.0	23.7	10.0	25.7	10.0	27.8	11.4	32.3	12.2	34.6	13.0	37.0	16.7	47.6
	2	10	10.0	21.8	10.0	24.4	10.0	30.2	10.0	33.3	10.0	36.5	10.5	43.5	11.4	47.2	12.4	51.0	14.3	59.2	15.4	63.5	16.5	67.9	21.1	87.2
	2	20	10.0	19.5	10.0	21.8	10.0	27.0	10.0	29.7	10.0	32.6	10.0	38.8	10.7	42.1	11.6	45.6	13.4	52.9	14.4	56.7	15.4	60.7	19.8	78.0
	2	50	10.0	16.4	10.0	18.4	10.0	22.7	10.0	25.1	10.0	27.5	10.0	32.7	10.0	35.5	10.6	38.4	12.3	44.5	13.1	47.8	14.1	51.1	18.1	65.7
	2	100	10.0	14.1	10.0	15.8	10.0	19.5	10.0	21.5	10.0	23.6	10.0	28.1	10.0	30.5	10.0	33.0	11.4	38.2	12.2	41.0	13.0	43.9	16.7	56.4
	3	10	10.0	32.8	10.0	36.8	10.0	45.4	10.0	50.1	10.0	55.0	10.5	65.4	11.4	71.0	12.4	76.8	14.3	89.0	15.4	95.5	16.5	102.2	21.1	131.3
	3	20	10.0	27.2	10.0	30.5	10.0	37.6	10.0	41.5	10.0	45.5	10.0	54.2	10.7	58.8	11.6	63.6	13.4	73.8	14.4	79.1	15.4	84.7	19.8	108.7
	3	50	10.0	19.7	10.0	22.1	10.0	27.3	10.0	30.1	10.0	33.1	10.0	39.3	10.0	42.7	10.6	46.2	12.3	53.5	13.1	57.4	14.1	61.5	18.1	78.9
	3	100	10.0	14.1	10.0	15.8	10.0	19.5	10.0	21.5	10.0	23.6	10.0	28.1	10.0	30.5	10.0	33.0	11.4	38.2	12.2	41.0	13.0	43.9	16.7	56.4
Roof > 7 to 27 degrees	1	10	10.0	11.9	10.0	13.3	10.4	16.5	11.4	18.2	12.5	19.9	14.9	23.7	16.2	25.7	17.5	27.8	20.3	32.3	21.8	34.6	23.3	37.0	30.0	47.6
	1	20	10.0	11.6	10.0	13.0	10.0	16.0	10.4	17.6	11.4	19.4	13.6	23.0	14.8	25.0	16.0	27.0	18.5	31.4	19.9	33.7	21.3	36.0	27.3	46.3
	1	50	10.0	11.1	10.0	12.5	10.0	15.4	10.0	17.0	10.0	18.6	11.9	22.2	12.9	24.1	13.9	26.0	16.1	30.2	17.3	32.4	18.5	34.6	23.8	44.5
	1	100	10.0	10.8	10.0	12.1	10.0	14.9	10.0	16.5	10.0	18.1	10.5	21.5	11.4	23.3	12.4	25.2	14.3	29.3	15.4	31.4	16.5	33.6	21.1	43.2
	2	10	10.0	25.1	10.0	28.2	10.4	34.8	11.4	38.3	12.5	42.1	14.9	50.1	16.2	54.3	17.5	58.7	20.3	68.1	21.8	73.1	23.3	78.2	30.0	100.5
	2	20	10.0	22.8	10.0	25.6	10.0	31.5	10.4	34.8	11.4	38.2	13.6	45.4	14.8	49.3	16.0	53.3	18.5	61.8	19.9	66.3	21.3	71.0	27.3	91.2
	2	50	10.0	19.7	10.0	22.1	10.0	27.3	10.0	30.1	10.0	33.0	11.9	39.3	12.9	42.7	13.9	46.1	16.1	53.5	17.3	57.4	18.5	61.4	23.8	78.9
	3	20	10.0	22.8	10.0	25.6	10.0	31.5	10.4	34.8	11.4	38.2	13.6	45.4	14.8	49.3	16.0	53.3	18.5	61.8	19.9	66.3	21.3	71.0	27.3	91.2
	3	50	10.0	19.7	10.0	22.1	10.0	27.3	10.0	30.1	10.0	33.0	11.9	39.3	12.9	42.7	13.9	46.1	16.1	53.5	17.3	57.4	18.5	61.4	23.8	78.9
	3	100	10.0	17.4	10.0	19.5	10.0	24.1	10.0	26.6	10.0	29.1	10.5	34.7	11.4	37.6	12.4	40.7	14.3	47.2	15.4	50.6	16.5	54.2	21.1	69.6
Roof > 27 to 45 degrees	1	10	11.9	13.0	13.3	14.6	16.5	18.0	18.2	19.8	19.9	21.8	23.7	25.9	25.7	28.1	27.8	30.4	32.3	35.3	34.6	37.8	37.0	40.5	47.6	52.0
	1	20	11.6	12.3	13.0	13.8	16.0	17.1	17.6	18.8	19.4	20.7	23.0	24.6	25.0	26.7	27.0	28.9	31.4	33.5	33.7	35.9	36.0	38.4	46.3	49.3
	1	50	11.1	11.5	12.5	12.8	15.4	15.9	17.0	17.5	18.6	19.2	22.2	22.8	24.1	24.8	26.0	25.8	30.2	31.1	32.4	33.3	34.6	35.7	44.5	45.8
	1	100	10.8	10.8	12.1	12.1	14.9	14.9	16.5	16.5	18.1	18.1	21.5	21.5	23.3	23.3	25.2	25.2	29.3	29.3	31.4	31.4	33.6	33.6	43.2	43.2
	2	10	11.9	15.2	13.3	17.0	16.5	21.0	18.2	23.2	19.9	25.5	23.7	30.3	25.7	32.9	27.8	35.6	32.3	41.2	34.6	44.2	37.0	47.3	47.6	60.8
	2	20	11.6	14.5	13.0	16.3	16.0	20.1	17.6	22.2	19.4	24.3	23.0	29.0	25.0	31.4	27.0	34.0	31.4	39.4	33.7	42.3	36.0	45.3	46.3	58.1
	2	50	11.1	13.7	12.5	15.3	15.4	18.9	17.0	20.8	18.6	22.9	22.2	27.2	24.1	29.5	26.0	32.0	30.2	37.1	32.4	39.8	34.6	42.5	44.5	54.6
	3	100	10.8	13.0	12.1	14.6	14.9	18.0	16.5	19.8	18.1	21.8	21.5	25.9	23.3	28.1	25.2	30.4	29.3	35.3	31.4	37.8	33.6	40.5	43.2	52.0
	3	10	11.9	15.2	13.3	17.0	16.5	21.0	18.2	23.2	19.9	25.5	23.7	30.3	25.7	32.9	27.8	35.6	32.3	41.2	34.6	44.2	37.0	47.3	47.6	60.8
	3	20	11.6	14.5	13.0	16.3	16.0	20.1	17.6	22.2	19.4	24.3	23.0	29.0	25.0	31.4	27.0	34.0	31.4	39.4	33.7	42.3	36.0	45.3	46.3	58.1
	3	50	11.1	13.7	12.5	15.3	15.4	18.9	17.0	20.8	18.6	22.9	22.2	27.2	24.1	29.5	26.0	32.0	30.2	37.1	32.4	39.8	34.6	42.5	44.5	54.5
	3	100	10.8	13.0	12.1	14.6	14.9	18.0	16.5	19.8	18.1	21.8	21.5	25.9	23.3	28.1	25.2	30.4	29.3	35.3	31.4	37.8	33.6	40.5	43.2	52.0
Wall	4	10	13.0	14.1	14.6	15.8	18.0	19.5	19.8	21.5	21.8	23.6	25.9	28.1	28.1	30.5	30.4	33.0	35.3	38.2	37.8	41.0	40.5	43.9	52.0	56.4
	4	20	12.4	13.5	13.9	15.1	17.2	18.7	18.9	20.6	20.8	22.6	24.7	26.9	26.8	29.2	29.0	31.6	33.7	36.7	36.1	39.3	38.7	42.1	49.6	54.1
	4	50	11.6	12.7	13.0	14.3	16.1	17.6	17.8	19.4	19.5	21.3	23.2	25.4	25.2	27.5	27.2	29.8	31.5	34.6	33.9	37.1	36.2	39.7	46.6	51.0
	4	100	11.1	12.2	12.4	13.6	15.3	16.8	16.9	18.5	18.5	20.4	22.0	24.2	23.9	26.3	25.9	28.4	30.0	33.0	32.2	35.4	34.4	37.8	44.2	48.6
	5	10	13.0	17.4	14.6	19.5	18.0	24.1	19.8	26.6	21.8	29.1	25.9	34.7	28.1	37.6	30.4	40.7	35.3	47.2	37.8	50.6	40.5	54.2	52.0	69.6
	5	20	12.4	16.2	13.9	18.2	17.2	22.5	18.9	24.8	20.8	27.2	24.7	32.4	26.8	35.1	29.0	38.0	33.7	44.0	36.1	47.2	38.7	50.5	49.6	64.9
	5	50	11.6	14.7	13.0	16.5	16.1	20.3	17.8	22.4	19.5	24.6	23.2	29.3	25.2	31.8	27.2	34.3	31.6	39.8	33.9	42.7	36.2	45.7	46.6	58.7
	5	100	11.1	13.5	12.4	15.1	15.3	18.7	16.9	20.6	18.5	22.6	22.0	26.9	23.9	29.2	25.9	31.6	30.0	36.7	32.2	39.3	34.4	42.1	44.2	54.1

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m², 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa.
a. The effective wind area shall be equal to the span length multiplied by an effective width. This width shall be permitted to be not be less than one-third the span length. For cladding fasteners, the effective wind area shall not be greater than the area that is tributary to an individual fastener.
b. For effective areas between those given above, the load may be interpolated; otherwise, use the load associated with the lower effective area.
c. Table values shall be adjusted for height and exposure by multiplying by the adjustment coefficient in Table R301.2(3).
d. See Figure R301.2(7) for location of zones.
e. Plus and minus signs signify pressures acting toward and away from the building surfaces.

TABLE 3.1 Comparison of Roof Angle Categories

2015 IRC	2000–2012 IRC
• 0 to 7 degrees	• 0 to 10 degrees
• Greater than 7 to 27 degrees	• Greater than 10 to 30 degrees
• Greater than 27 to 45 degrees	• Greater than 30 to 45 degrees

determining component and cladding loads. Roof slope is divided into three categories. The categories are based on component and cladding roof slope divisions in ASCE 7 for hip roofs. Table 3.1 below compares the new categories for roof slope to those in previous editions.

Justification: Model code is updated to correct wind speed requirements for cladding based on code referenced structural standards.

TABLE R301.7
ALLOWABLE DEFLECTION OF STRUCTURAL MEMBERS [b, c]

STRUCTURAL MEMBER	ALLOWABLE DEFLECTION
Rafters having slopes greater than 3:12 with no finished ceiling attached to rafters	*L*/180
Interior walls and partitions	*H*/180
Floors/ceilings with plaster or stucco finish	*L*/360
All other structural members	L/240
Exterior walls—wind loads [a] with plaster or stucco finish	*H*/360
Exterior walls with other brittle finishes	*H*/240
Exterior walls with flexible finishes	*H*/120d
Lintels supporting masonry veneer walls [e]	*L*/600

Note: *L* = span length, *H* = span height.
a. The wind load shall be permitted to be taken as 0.7 times the Component and Cladding loads for the purpose of the determining deflection limits herein.
b. For cantilever members, *L* shall be taken as twice the length of the cantilever.
c. For aluminum structural members or panels used in roofs or walls of sunroom additions or patio covers, not supporting edge of glass or sandwich panels, the total load deflection shall not exceed *L*/60. For continuous aluminum structural members supporting edge of glass, the total load deflection shall not exceed *L*/175 for each glass lite or *L*/60 for the entire length of the member, whichever is more stringent. For sandwich panels used in roofs or walls of sunroom additions or patio covers, the total load deflection shall not exceed *L*/120.
d. Deflection for exterior walls with interior gypsum board finish shall be limited to an allowable deflection of *H*/180.
e. Refer to Section 703.7.2.

TABLE R301.7
ALLOWABLE DEFLECTION OF STRUCTURAL MEMBERS [b, c]

STRUCTURAL MEMBER	ALLOWABLE DEFLECTION
Rafters having slopes greater than 3:12 with finished ceiling not attached to rafters	*L*/180
Interior walls and partitions	*H*/180
Floors	*L*/360
Ceilings with brittle finishes (including plaster and stucco)	L/360
Ceilings with flexible finishes (including gypsum board)	L/240
All other structural members	L/240
Exterior walls—wind loads [a] with plaster or stucco finish	*H*/360
Exterior walls—wind loads [a] with other brittle finishes	*H*/240
Exterior walls—wind loads [a] with flexible finishes	*H*/120d
Lintels supporting masonry veneer walls [e]	*L*/600

Note: *L* = span length, *H* = span height.
a. ~~The~~ For the purpose of the determining deflection limits herein, the wind load shall be permitted to be taken as 0.7 times the ~~Component~~ component and ~~Cladding~~ cladding (ASD) loads ~~for the purpose of the determining deflection limits herein.~~ obtained from Table R301.2(2).
b. For cantilever members, *L* shall be taken as twice the length of the cantilever.
c. For aluminum structural members or panels used in roofs or walls of sunroom additions or patio covers, not supporting edge of glass or sandwich panels, the total load deflection shall not exceed *L*/60. For continuous aluminum structural members supporting edge of glass, the total load deflection shall not exceed *L*/175 for each glass lite or *L*/60 for the entire length of the member, whichever is more stringent. For sandwich panels used in roofs or walls of sunroom additions or patio covers, the total load deflection shall not exceed *L*/120.
d. Deflection for exterior walls with interior gypsum board finish shall be limited to an allowable deflection of *H*/180.
e. Refer to Section ~~703.7.2.~~ R703.8.2.

City of Houston Amendment

Analysis: This code change proposal was submitted by the ICC Building Code Action Committee (BCAC). The BCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance an assigned International Code or portion thereof. This includes both the technical aspects of the codes as well as the code content in terms of scope and application of referenced standards. Since its inception in 2011, the BCAC has held 6 open meetings and numerous workgroup calls which included members of the BCAC as well as any interested party to discuss and debate the proposed changes. Related documentation and reports are posted on the BCAC website at:

http://www.iccsafe.org/cs/BCAC/Pages/default.aspx.

The original code change was intended to clarify two issues.

1. There is confusion regarding the deflection allowed for deck joists. It was not clear if the original authors intended deck joists to be considered as a floor joist (L/360) or as "other structural members" (L/240). This change clarifies the intention.
2. The other significant change addresses the flexibility/stiffness of gypsum board which is a lot more common than either plaster of stucco in most parts of the country. There is now cleaner differentiation between materials and is consistent with the allowable deflection limits in Table R802.4(1) and R802.4(2).

The original proposal was rejected for fixes through public comment.

Public comment changes to the original proposal was intended to do the following:

1) Remove a proposed reference to decks. There was no consensus as to whether deck floors meant deck boards or deck joists. BCAC leaves this controversy unresolved by removing the reference to decks from the original proposal.
2) Retain separate lines in the table for floors and ceilings, so it is clear that all floors are L/360, which is the current intent of the table (the current entry for "floors/ceilings with plaster or stucco finish" is intended to apply to all floors and all ceilings with plaster or stucco finish);
3) Makes it clear that gypsum board is considered a flexible finish
4) Makes some minor editorial changes to remove "etc." which is not typical code language.

In short, there are no change to the previous technical code requirements or code intent of this section.

		Justification: This amendment is needed to ensure that building projections do not lessen the fire safety requirements of the code.
R302.1 Exterior walls. Construction, projections, openings, and penetrations of *exterior walls* of *dwellings* and accessory buildings shall comply with Table R302.1(1); or *dwellings* equipped throughout with an *automatic sprinkler system* installed in accordance with Section P2904 shall comply with Table R302.1(2). Projections shall not extend beyond a point one-third the distance into areas where openings are prohibited. **Exceptions:** **1.** Walls, projections, openings, or penetrations in walls perpendicular to the line used to determine the *fire separation distance*. **2.** Walls of *dwellings* and *accessory structures* located on the same *lot*. **3.** Detached tool sheds and storage sheds, playhouses and similar structures exempted from permits are not required to provide wall protection based on location on the *lot*. Projections beyond the *exterior wall* shall not extend over the *lot line*. **4.** Detached garages accessory to a *dwelling* located within 2 feet (610 mm) of a *lot line* are permitted to have roof eave projections not exceeding 4 inches (102 mm). **5.** Foundation vents installed in compliance with this code are permitted.	**R302.1 Exterior walls.** Construction, projections, openings, and penetrations of *exterior walls* of *dwellings* and accessory buildings shall comply with Table R302.1(1); or *dwellings* equipped throughout with an *automatic sprinkler system* installed in accordance with Section P2904 shall comply with Table R302.1(2). Projections shall not extend within 2 feet of a lot line or to an imaginary line between two buildings on the same lot in accordance with the definition of *Fire Separation Distance* in this code. **Exceptions:** **1.** Walls, projections, openings, or penetrations in walls perpendicular to the line used to determine the *fire separation distance.* **2.** Walls of *dwellings* and *accessory structures* located on the same *lot.* **3.** Detached tool sheds and storage sheds, playhouses and similar *structure*s exempted from permits are not required to provide wall protection based on location on the *lot.* Projections beyond the *exterior wall* shall not extend over the *lot line.* **4.** Detached garages accessory to a *dwelling* located within 2 feet (610 mm) of a *lot line* are permitted to have roof eave projections not exceeding 4 inches (102 mm). **5.** Foundation vents installed in compliance with this code are permitted.	***City of Houston Amendment*** **Analysis:** The existing amendment was modified for clarity to document the model code intent. Unprotected roof overhangs are now permitted to project to within 2 feet of the property line when fire-blocking is installed between the top of the wall and the roof sheathing. As a basic rule, projections are not permitted less than 2 feet from the property line. For dwellings with or without fire sprinkler protection, penetrations of exterior walls do not require fire-resistant protection unless they are located less than 3 feet from the property line. ***No change to the previous technical code requirements or code intent of this section.*** **Justification:** This amendment is needed to ensure that building projections do not lessen the fire safety requirements of the code.
R302.1.1 Zero lot line separation. Where perpetual, platting, and recorded easements create a non-buildable minimum fire separation distance of at least 6 feet between structures on adjacent properties, the one-hour fire-resistive ratings shall not apply.	**N/A**	***City of Houston Amendment*** **Analysis:** The COH amendment was deleted to correlate with code changes associated with other code changes that revert the Houston code back to model code minimums. **Justification:** The committee recommends not keeping this amendment, as it had the effect of reducing fire safety.

TABLE R302.1(1)
EXTERIOR WALLS

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E 119 or UL 263 with exposure from both sides	<5~~3~~ feet
	Not fire-resistance rated	0 hours	≥5~~3~~ feet
Projections	Fire-resistance rated	1 hour on the face and underside	≥2 feet to <5~~3~~ feet
	Not fire-resistance rated	0 hours	≥5~~3~~ feet
Openings in walls	Not allowed	N/A	< 3 feet
	25% Maximum of Wall Area	0 hours	3 feet
	Unlimited	0 hours	5 feet

TABLE R302.1(1)
EXTERIOR WALLS

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANT RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E 119 or UL 263 with exposure from both sides	< 5 feet
	Not fire-resistance rated	0 hours	≥ 5 feet
Projections	Not Allowed	N/A	< 2 feet
	Fire-resistance rated	1 hour on the face and underside a, b	≥ 2 feet to < 5 feet
	Not fire-resistance rated	0 hours	≥ 5 feet
Openings	Not Allowed	N/A	< 3 feet
	25% maximum of wall area c	0 hours	3 feet
	Unlimited	0 hours	5 feet

City of Houston Amendment

Analysis: The previous 2012 amendment was modified to retain the model code minimum provisions for fire separation from structures to property or lot lines or other buildings located on the same property. Added new footnote to coordinate with IBC and address a compliance issue that is not specifically addressed for single-family residential carports with a fire separation distance of 3-feet to the property line.

Unprotected roof overhangs are now permitted to project to within 2 feet of the property line when fire-blocking is installed between the top of the wall and the roof sheathing. In most cases, projections are not permitted less than 2 feet from the property line. For dwellings with or without fire sprinkler protection, penetrations of exterior walls do not require fire-resistant protection unless they are located less than 3 feet from the property line.

CHANGE SIGNIFICANCE: The code has long recognized the effectiveness of providing space between the exterior wall and the lot line in preventing the spread of fire from a building on one property to a building on another property. Unless the exterior wall is constructed to provide a 1-hour fire-resistance rating in accordance with either ASTM E-119 or UL 263, a minimum fire separation distance is required from the lot line. The consensus as to the minimum distance necessary to provide a sufficient buffer against the spread of fire has changed somewhat over the years, settling on a minimum distance of 5 feet in the 2006 edition of the IRC. Beginning with the 2012 edition, the code reduces the threshold for nonrated walls to 3 feet of separation when the building is protected with an automatic fire sprinkler

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

COLOR CODE INDEX: **Turquoise** = NEW or Modified Text by ICC in 2015 | **Yellow Strike through** = Text Deleted from the Code by COH | **Text Underlined** = COH Amendment added (NEW) | **Green Text** = NEW or Modified Text by COH in 2015 | **Grey Text** = Previous COH Amendment Brought Forward to 2015 | **Strike through** = Text Deleted from the Code by ICC

Penetrations	All	Comply with Section R302.4	< 5 feet
		None required	5 feet

For SI: 1 foot = 304.8 min.
N/A = Not Applicable

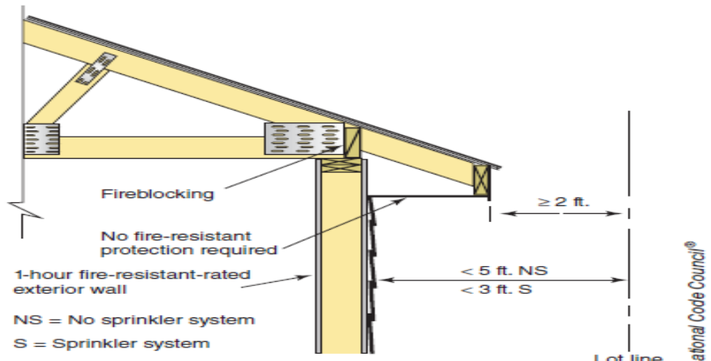
Penetrations	All	Comply with Section R302.4	< 53 feet
		None required	53 feet

For SI: 1 foot = 304.8 mm.
N/A = Not Applicable

a. Roof eave fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave if fire blocking is provided from the wall top plate to the underside of the roof sheathing.

b. Roof eave fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave provided that gable vent openings are not installed.

C. Opening requirements do not apply to noncombustible carports open on two sides.



Fire resistance rating is not required for roof eave projections when fireblocking is installed.

system. The 5-foot rule still applies to buildings without sprinkler systems. The choice of providing either adequate fire separation distance or fire-resistant-rated construction also extends to openings, penetrations, and projections—some fire resistance measures must be provided when the fire separation distance to the property line falls below the code-prescribed dimension.

Roof eaves constructed without fire-resistant protection are permitted to project to not less than 5 feet from the lot line for buildings without fire sprinkler systems and not less than 3 feet from the lot line for buildings with sprinklers. For eave projections with a separation distance less than those dimensions, the code requires 1-hour fire-resistant protection on the underside of the overhang. The 2015 IRC provides an option to builders to eliminate the soffit protection when fire-blocking is installed between the top plate of the exterior fire-resistant-rated wall and the roof sheathing. For a fire originating on the adjacent property, the fire-blocking above the wall protects against the spread of fire through the overhang into the attic area. This effectively extends a measure of fire resistance at the exterior wall to the roof line and is considered equivalent protection to a 1-hour-rated soffit. In this case, the unprotected eave projection is viewed as expendable because the barrier to the spread of fire is established at the exterior wall line.

In almost all circumstances, the code does not permit any portion of a roof overhang, with or without fire protection, to be constructed less than 2 feet from a lot line. This point is clarified by the addition of a line in Tables R302.1(1) and R302.1(2) that states that projections are not allowed with a fire separation distance of less than 2 feet. However, there are a couple of exceptions to this rule that have not changed and are still in effect. Exception 4 to the exterior wall provisions of Section R302.1 specifically allows a maximum 4-inch roof eave projection for detached garages located within 2 feet of a lot line. For example, a detached garage that is accessory to the dwelling on the same lot and has an exterior wall located 1 foot from the lot line requires 1-hour fire-resistant-rated construction for that exterior wall. Under the exception, a 4-inch overhang that would project to 8 inches from the lot line is permitted in this case. Most code users have inferred that 1-hour protection is required on the underside of this overhang in accordance with the applicable table and that the exception only applies to the permitted location of the overhang, not the fire-resistance provisions.

...Continued Below

Justification: Model code provides an exception to eliminate exterior wall protection requirements for noncombustible residential carports. However, the model code does not address the code provisions for protected openings for that same carport. This COH amendment footnote corrects this fire-safety oversite.

TABLE R302.1(2)
EXTERIOR WALLS—DWELLINGS WITH FIRE SPRINKLERS

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E 119 or UL 263 with exposure from both sides	0 feet
	Not fire-resistance rated	0 hours	3 feet [a]
Projections	Not allowed	N/A	< 2 feet
	Fire-resistance rated	1 hour on the underside [b, c]	2 feet [a]
	Not fire-resistance rated	0 hours	3 feet
Openings in walls	Not Allowed	N/A	< 3 feet
	Unlimited	0 hours	3 feet [a]
Penetrations	All	Comply with Section R302.4	< 3 feet
		None Required	3 feet [a]

For SI: 1 Foot = 304.8 mm.

TABLE R302.1(2)
EXTERIOR WALLS—DWELLINGS WITH FIRE SPRINKLERS

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E 119 or UL 263 with exposure from both sides	0 feet
	Not fire-resistance rated	0 hours	3 feet [a]
Projections	Not allowed	N/A	< 2 feet
	Fire-resistance rated	1 hour on the face and underside [b, c]	2 feet [a]
	Not fire-resistance rated	0 hours	3 feet
Openings in walls	Not Allowed [d]	N/A	< 3 feet
	Unlimited	0 hours	3 feet [a]
Penetrations	All	Comply with Section R302.4	< 3 feet
		None Required	3 feet [a]

For SI: 1 Foot = 304.8 mm.

City of Houston Amendment

Analysis: Added footnote to address a coordination and compliance issue that is not specifically addressed for single-family residential carports with a fire separation distance of 3-feet to the property line. ***No change to the previous technical code requirements or code intent of this section.***

The second exception that permits projections less than 2 feet from the lot line first appeared in the 2012 edition of the IRC. Footnote a of Table R302.1(2) allows rated projections with a fire separation distance of 0 feet when other criteria are satisfied. All dwellings in the subdivision require automatic fire sprinkler systems and buildings on the adjoining property require an open setback yard that is not less than 6 feet. This required setback on the opposite side of the lot line ensures that a minimum 6-foot separation distance is maintained between the exterior walls of the two buildings. With the added protection of a fire sprinkler system, the 6-foot separation is consistent with the provisions for unrated walls and unlimited openings in Table R302.1(2), which requires a 3-foot fire separation distance for each building. Although there are no fire-resistance requirements for the exterior wall under this exception, the 1-hour protection on the underside of the projection is still required. Table 3-2 summarizes the fire separation distance requirements for projections.

In the 2012 edition of the IRC, where wall assemblies are required to be fire-resistance rated, penetrating items require protection to maintain the fire resistance of the wall. For dwellings with automatic fire sprinkler systems, the trigger point for installing a rated wall assembly and penetration protection is a fire separation distance of less than 3 feet. For dwellings without sprinklers, the dimension has been less than 5 feet. However, the IRC has allowed a limited amount of unprotected openings such as windows and doors in exterior walls of unsprinklered dwellings when the fire separation distance was less than 5 feet but not less than 3 feet. In the 2015 IRC, this same allowance is applied to penetrations—fire

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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N/A = Not Applicable **a.** For residential subdivisions where all *dwellings* are equipped throughout with an automatic sprinkler system installed in accordance with Section P2904, the *fire separation distance* for nonrated exterior walls and rated projections shall be permitted to be reduced to 0 feet, and unlimited unprotected openings and penetrations shall be permitted, where the adjoining *lot* provides an open setback *yard* that is 6 feet or more in width on the opposite side of the property line. **b.** The roof eave fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave if fire blocking is provided from the wall top plate to the underside of the roof sheathing. **c.** The roof eave fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave provided that gable vent openings are not installed.	**N/A =** Not Applicable **a.** For residential subdivisions where all *dwellings* are equipped throughout with an automatic sprinkler system installed in accordance with Section P2904, the *fire separation distance* for nonrated exterior walls and rated projections shall be permitted to be reduced to 0 feet, and unlimited unprotected openings and penetrations shall be permitted, where the adjoining *lot* provides an open setback *yard* that is 6 feet or more in width on the opposite side of the property line. **b.** The roof eave fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave if fire blocking is provided from the wall top plate to the underside of the roof sheathing. **c.** The roof eave fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave provided that gable vent openings are not installed. **d.** Opening requirements do not apply to noncombustible carports that are open on two sides.	*protection of the penetration is not required unless the exterior wall is less than 3 feet from the lot line. The penetration provisions for exterior walls now match for dwellings with sprinklers and those without. This is considered a reasonable accommodation for small penetrations such as hose bibbs, dryer vent terminations, mechanical draft terminals, and electrical equipment without impairing the effectiveness of the fire-resistant rated assembly. For penetrations less than 3 feet from the lot line, Section R302.4 prescribes the methods of protection to prevent the passage of flame and hot gases at the penetrations.* **Justification:** Model code provides an exception to eliminate exterior wall protection requirements for noncombustible residential carports. However, the model code does not address the code provisions for protected openings for that same carport. This COH amendment footnote corrects this fire-safety oversite.
R302.2 Townhouses. Each *townhouse* shall be considered a separate building and shall be separated by fire-resistance rated wall assemblies meeting the requirements of Section R302.1 for exterior walls. **Exception:** A common 1-hour fire-resistance-rated wall assembly tested in accordance with ASTM E 119 or UL 263 is permitted for townhouses if such walls do not contain plumbing or mechanical equipment, ducts, or vents in the cavity of the common wall. The wall shall be rated for fire exposure from both sides and shall extend to and be tight against exterior walls and the underside of the roof sheathing. Electrical installations shall be installed in accordance with Chapters 34 through 43. Penetrations of electrical outlet boxes shall be in accordance with Section R302.4. **R302.2.4 Structural independence.** Each individual *townhouse* shall be structurally independent. **Exceptions:** **1.** Foundations supporting *exterior walls* or common walls. **2.** Structural roof and wall sheathing from each unit may fasten to the common wall framing. **3.** Nonstructural wall and roof coverings. **4.** Flashing at termination of roof covering over common wall. **5.** *Townhouses* separated by a common 1-hour fire-resistance-rated wall as provided in Section R302.2.	**R302.2 Townhouses.** ~~Each townhouse shall be considered a separate building and shall be separated by fire-resistance rated wall assemblies meeting the requirements of Section R302.1 for exterior walls.~~ Common walls separating townhouses shall be assigned a fire resistance rating in accordance with Section R302.2 Item 1 or 2. The common wall shared by two townhouses shall be constructed without plumbing or mechanical equipment, ducts, or vents in the cavity of the common wall. The wall shall be rated for fire exposure from both sides and shall extend to and be tight against exterior walls and the underside of the roof sheathing. Electrical installations shall be in accordance with Chapters 34 through 43. Penetrations of the membrane of common walls for electrical outlet boxes shall be in accordance with Section R302.4. ~~**Exceptions:**~~ **1.** Where a fire sprinkler system in accordance with Section P2904 **(NFPA 13D)** is provided, ~~A~~ the common wall shall be not less than a 1-hour fire-resistance-rated wall assembly tested in accordance with ASTM E 119 or UL 263~~. Is permitted for townhouses if such walls do not contain plumbing or mechanical equipment, ducts, or vents in the cavity of the common wall. The wall shall be rated for fire exposure from both sides and shall extend to and be tight against exterior walls and the underside of the roof sheathing. Electrical installations shall be installed in accordance with Chapters 34 through 43. Penetrations of electrical outlet boxes shall be in accordance with Section R302.4.~~ **2.** Where a fire sprinkler system in accordance with Section P2904 is not provided, the common wall shall be not less than a 2-hour fire-resistance-rated wall assembly tested in accordance with ASTM E 119 or UL 263. **R302.2.4 Structural independence.** Each individual townhouse shall be structurally independent. **Exceptions:** **1.** Foundations supporting exterior walls or common walls. **2.** Structural roof and wall sheathing from each unit ~~may fasten~~ fastened to the common wall framing. **3.** Nonstructural wall and roof coverings. **4.** Flashing at termination of roof covering over common wall. **5.** Townhouses separated by a common ~~1-hour fire-resistance-rated~~ wall as provided in Section R302.2~~, Exception Item 1 or 2~~**.**	***City of Houston Amendment*** **Analysis Summary:** The provisions for separating townhouses with structurally independent fire-resistant-rated walls in accordance with Section R302.1 have been removed in favor of the common wall provisions of Section R302.2. Because risk of fire in multi-family structures are higher than one- and two-family structures, additional fire compartmentalization is provided in the construction. Common walls separating townhouses must be 2-hour rated when an automatic fire sprinkler system is not installed in the townhouse dwelling units. Because the common wall has the potential to create an interconnection between the adjacent dwelling units and reduce the clear separation that would exist if two separate walls were constructed, the code places limits on services being located within the wall. This exception does not permit the inclusion of any type of plumbing, mechanical equipment, ducts, or vents within the cavity of the common wall. This prohibition is applicable even if the penetrations or openings are protected by the penetration provisions of Section R302.4 or if a damper is installed in the duct or vent. The prohibition on plumbing includes all types of plumbing materials and systems, as well as water supply and drainage piping of either combustible or noncombustible materials. However, the exception permits the cavity of the wall to be used for electrical installations if they comply with the electrical provisions of the code and the penetrations are properly protected. *CHANGE SIGNIFICANCE: In previous editions of the IRC, the general rule required townhouses to be considered separate buildings with each building having a 1-hour fire-resistant-rated wall to separate it from the adjoining townhouse. The 1-hour rating was determined in accordance with Section R302.1 for exterior walls based on the fire separation distance between the individual townhouse units. This resulted in two separate 1-hour-rated walls where townhouses joined. Section R302.2.4 further required that each individual townhouse be structurally independent, meaning that a collapse of the structural wall, floor, ceiling, or roof components of one townhouse in a fire incident would not impair the structural integrity of the adjoining townhouse. As an alternative, the IRC has always provided for constructing a common fire-resistant-rated wall between townhouse units. Because the common wall supports structural floor and roof elements of the townhouse dwelling units on both sides, structural independence is not possible and is not required for the common wall option. But this option has always limited installations in the wall to electrical components. To preserve structural integrity and limit penetrations of the fire-resistant membrane, the code does not permit the installation of plumbing or mechanical equipment, ducts, or vents in the cavity of the common wall.* *In the 2015 IRC, the exception for constructing a common wall becomes the rule and the only prescriptive option for separating townhouses. References to the exterior wall provisions in Section R302.1 have been removed. The structural independence requirement of Section R302.2.4 no longer applies because Exception 5 will be in effect for all installations. In practice, this change may not have a significant impact on the way townhouses are constructed. In many geographic regions, the common wall option has been the preferred method for most designers and builders. Prior to the 2009 edition of the IRC, the common wall for separation of townhouses was required to be a 2-hour fire-resistant-rated wall assembly. With the introduction of mandatory fire sprinkler requirements for all new dwelling units in the*

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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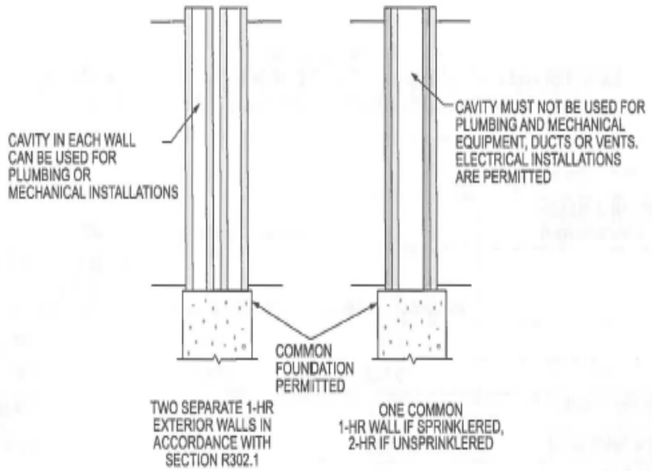
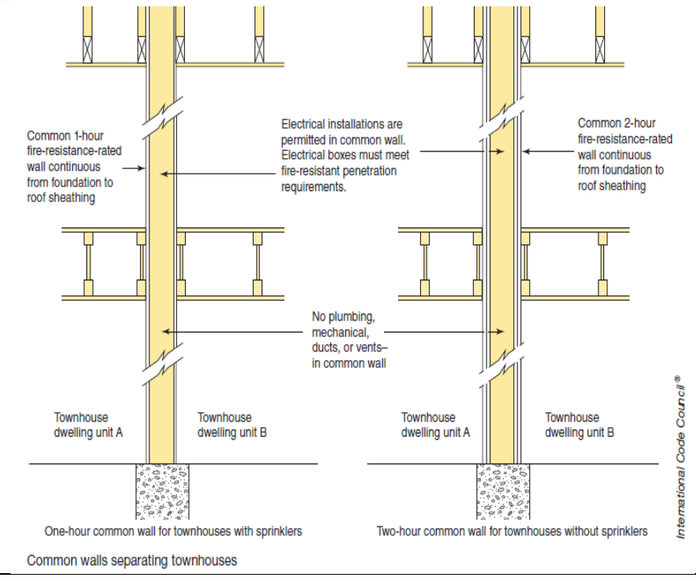


Figure R302.2
DWELLING UNIT SEPARATION FOR TOWNHOUSES



Common walls separating townhouses

2009 IRC, the rating of the common wall was reduced to 1 hour. The reduced rating reflected a consensus that automatic sprinkler systems would improve fire safety and that the 1-hour rating would provide a reasonable level of passive fire protection. Although the change was based on the sprinkler provisions, the code language did not tie the two together—the sprinkler provisions and the fire resistance of the common wall were independent requirements. Because the basis for the reduced rating was an assumption that sprinklers would be installed, the fire rating of the common wall assembly is now tied to the presence of sprinklers. The 2-hour rating for non-sprinklered buildings has been reinstated in the 2015 IRC. For townhouse dwelling units protected with an automatic sprinkler system, the 1-hour rating is still in effect. The change was prompted by a concern that jurisdictions amending the IRC to remove the fire sprinkler requirements may not be amending the common wall provisions to reflect the 2-hour fire-resistant rating.

Justification: The committee recommends omitting this amendment in this section and relocate the code provisions to Table R302.6 as a more appropriate location in the code. Delete the portion regarding sheet metal.

R302.6 Dwelling/garage fire separation. The garage shall be separated as required by Table R302.6. Openings in garage walls shall comply with Section R302.5. This provision does not apply to garage walls that are perpendicular to the adjacent *dwelling unit* wall. Attic disappearing stairs shall be permitted to be installed in the garage ceiling provided the exposed panel is not less than ⅜ inch thick fire-retardant-treated plywood or covered with a minimum 16 gage sheet metal.

R302.6 ~~Dwelling/garage~~ Dwelling-garage fire separation. The garage shall be separated as required by Table R302.6. Openings in garage walls shall comply with Section R302.5. ~~This provision does~~ Attachment of gypsum board shall comply with Table R702.3.5. The wall separation provisions of Table R302.6 shall not apply to garage walls that are perpendicular to the adjacent *dwelling unit* wall.

TABLE R302.6
DWELLING GARAGE SEPARATION a

SEPARATION	MATERIAL
From the residence and attics	Not less than 1/2-inch gypsum board or equivalent applied to the garage side
From habitable rooms above the garage	Not less than 5/8-inch Type X gypsum board or equivalent
Structure(s) supporting floor/ceiling assemblies used for separation required by this section	Not less than 1/2-inch gypsum board or equivalent
Garages located less than 3 feet from a dwelling unit on the same lot	Not less than 1/2-inch gypsum board or equivalent applied to the interior side of exterior walls that are within this area

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

a. Disappearing or pull-down attic stairs may be installed in the garage ceiling provided the garage-side exposed panel is not less than ⅜-inch thick fire retardant-treated plywood, untreated plywood protected with ½-inch thick gypsum board, or untreated plywood coated with 60-minute rated intumescent paint. In all cases, the opening protection material must be applied to the garage side of the plywood.

City of Houston Amendment

Analysis: The COH amendment was omitted in section R302.6 and relocated to Footnote **a** of Table R302.6. ***No change to the previous technical code requirements or code intent of this provision.***

Justification: The COH Code Development committee recommends omitting the amendment in this section and relocating it to Table R302.6 as a more appropriate location in the code. The portion regarding sheet metal is deleted as there is no technical data to support keeping it.

Numerous potential hazards exist within garages because occupants of dwelling units tend to store a variety of hazardous materials there. Along with this and the potential for CO build-up within the garage, the code requires that the garage be separated from the dwelling unit and attic as indicated in Table R302.6. Garage walls and ceilings that do not form a separation from the dwelling unit are not required to be rated unless they are an extension of a rated assembly.

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 (12.7 mm) gypsum wallboard membrane, ⅝-inch (16 mm) wood structural panel

R302.13 Fire protection of floors. Floor assemblies that are not required elsewhere in this code to be fire-resistance rated, shall be provided with a 1/2-inch (12.7 mm) gypsum wallboard membrane, 5/8-inch (16 mm) wood

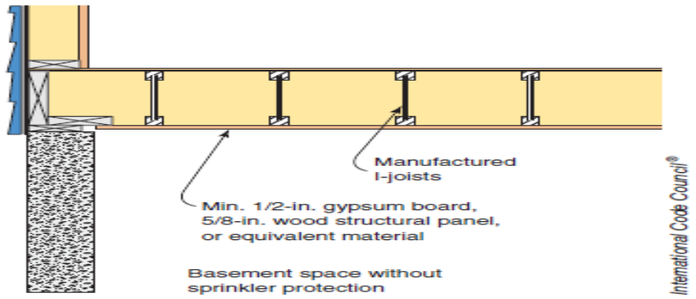
City of Houston Amendment

Analysis: Generally, only model code clarifications have been added to this section. The previous COH amendment is eliminate and the text returned to

membrane, or equivalent on the underside of the floor framing member where the underside of the floor framing is exterior to the building or is exposed to a room below.

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.
4. Wood floor assemblies using dimension lumber or structural composite lumber equal to or greater than 2-inch by 10-inch (50.8 mm by 254 mm) nominal dimension, or other approved floor assemblies demonstrating equivalent fire performance.



Fire protection of floors

structural panel membrane, or equivalent on the underside of the floor framing member ~~where the underside of the floor framing is exterior to the building or is exposed to a room below~~. Penetrations or openings for ducts, vents, electrical outlets, lighting, devices, luminaires, wires, speakers, drainage, piping and similar openings or penetrations shall be permitted.

Exceptions:

1. Floor assemblies located directly over a space protected by an automatic sprinkler system in accordance with Section P2904, NFPA 13D, 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 shall be permitted to be unprotected where complying with the following:
   - ~~**R302.13 Combustible insulation clearance.** Combustible insulation shall be separated a minimum~~
   - **3.1.** The aggregate area of ~~3 inches (76 mm) from recessed luminaires, fan motors and other heat-producing devices.~~ the unprotected portions do not exceed 80 square feet (7.4 m^2) per story
   - **3.2.** Fire blocking in accordance with Section R302.11.1 is installed along the perimeter of the unprotected portion to separate the unprotected portion from the remainder of the floor assembly.
4. Wood floor assemblies using dimension lumber or structural composite lumber equal to or greater than 2-inch by 10-inch (50.8 mm by 254 mm) nominal dimension, or other approved floor assemblies demonstrating equivalent fire performance.

Open web floor trusses requiring membrane protection on the underside

model code. ***No change to the previous technical code requirements or code intent of this section.***

CHANGE SIGNIFICANCE: Fire protection of floors first appeared in Section R501.3 of the 2012 IRC. The provisions call for installation of ½-inch gypsum board, 5/8-inch wood structural panel, or other approved material on the underside of floor assemblies of buildings constructed under the IRC. 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. Solid-sawn lumber and structural composite lumber perform well in retaining adequate strength under fire conditions, and floors framed of nominal 2 X 10s or larger of these materials are exempt from these fire protection requirements. Fire protection also is not required if sprinklers are installed to protect the space below the floor assembly.

In the 2009 IRC, there was an effort to organize all the fire-resistance provisions into a single section to make the code more user-friendly. Because the installation of the code-prescribed membrane intends to provide some limited protection against the effects of fire to the floor system, the requirements have been relocated to the fire-resistant construction provisions of Section R302.

Like the fire separation requirements for an attached garage in Section R302.6, the membrane applied to the underside of the floor system does not form a fire-resistant-rated assembly. The membrane acts to shield light-frame floor systems from the heat of a fire originating in the space below the floor. The intent is for the floor system to perform similarly to unprotected 2 X 10 solid-sawn lumber floor joists and to delay structural collapse of the floor system. For that reason, the code does not require any special treatment of joints, penetrations, or openings in the ceiling membrane. For example, the taping of the gypsum board joints is not required and penetrations for electrical boxes and plumbing pipes do not require any firestopping materials. The added language intends to simply clarify that the code does not regulate openings and penetrations in the membrane applied to the underside of the floor system.

Justification: The previous COH amendment is eliminate and the text returned to model code

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R303.4 Mechanical ventilation. Where the air infiltration rate of a dwelling unit is less than ~~5~~ 3 air changes per hour when tested with a blower door at a pressure of 0.2-inch w. c. (50 Pa) in accordance with the *International Energy Conservation Code* ~~Section N1102.4.1.2~~, the dwelling unit shall be provided with whole-house mechanical ventilation in accordance with Section M1507.3 or ASHRAE 62.2.

R303.4 Mechanical ventilation. Where the air infiltration rate of a *dwelling unit* is ~~less than~~ ~~5~~ 3 air changes per hour ~~when~~ or less where tested with a blower door at a pressure of 0.2-inch w. c. (50 Pa) in accordance with the *Energy Conservation Code* ~~Section N1102.4.1.2~~, the *dwelling unit* shall be provided with whole-house mechanical ventilation in accordance with Section M1507.3 or ASHRAE 62.2.

City of Houston Amendment

Analysis: No model code changes and only minor editorial changes to the previous COH amendment. ***No change to the previous technical code requirements or code intent of this section.***

Justification: Amendment needed to ensure conformity with state and local government policy.

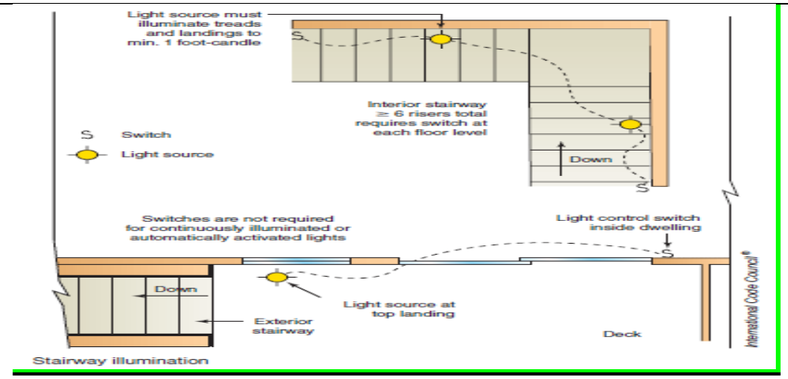
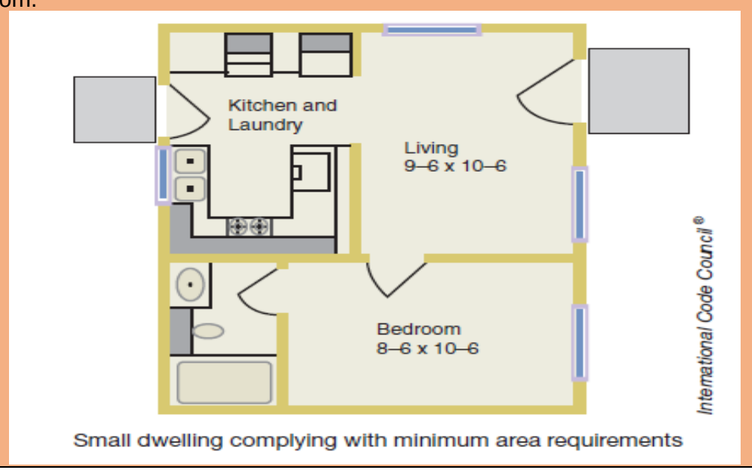
R303.5.1 Intake openings. Mechanical and gravity outdoor air intake openings shall be located a minimum of 10 feet (3,048 mm) from any hazardous or noxious contaminant, such as vents, chimneys, plumbing vents, streets, alleys, parking lots and loading docks, except as otherwise specified in this code. Where a source of contaminant is located within 10 feet (3,048 mm) of an intake

R303.5.1 Intake openings. Mechanical and gravity outdoor air intake openings shall be located ~~a minimum of~~ not less than 10 feet (3,048 mm) from any hazardous or noxious contaminant, such as vents, chimneys, plumbing vents, streets, alleys, parking lots and loading ~~docks, except as otherwise specified in this code. Where a source of contaminant is located within 10 feet~~

City of Houston Amendment

Analysis: Model code changes include three new exceptions to the general separation requirements identified in this section.

opening, such opening shall be located a minimum of 3 feet (914 mm) below the contaminant source. For the purpose of this section, the exhaust from *dwelling* unit toilet rooms, bathrooms and kitchens shall not be considered as hazardous or noxious.	~~(3,048 mm) of an intake opening, such opening shall be located a minimum of 3 feet (914 mm) below the contaminant source.~~ docks. For the purpose of this section, the exhaust from *dwelling* unit toilet rooms, bathrooms and kitchens shall not be considered as hazardous or noxious. **Exceptions:** **1.** The 10-foot (3,048 mm) separation is not required where the intake opening is located 3 feet (914 mm) or greater below the contaminant source. **2.** Vents and chimneys serving fuel-burning appliances shall be terminated in accordance with the applicable provisions of Chapters 18 and 24. **3.** Clothes dryer exhaust ducts shall be terminated in accordance with Section M1502.3.	*In the context of this section, intake openings include windows, doors, gravity air intakes, soffit vents, combustion air intake openings, outside air intakes for air handlers, makeup air intakes and similar openings that naturally or mechanically draw in air from the building exterior.* *This section identifies specific locations that are known to generate or emit noxious contaminants, and requires that both mechanical and gravity air intake openings be located a minimum of 10 feet (3048 mm) from such hazards to avoid introducing contaminants into the building.* *As an alternative, **Exception 1** allows mechanical and gravity air intakes to be located within 10 feet (3048 mm) of such sources of contamination if the intakes are located at least 3 feet (914 mm) below the contaminant source. A 3-foot (914 mm) vertical separation distance will allow the noxious gases and contaminants to disperse into the atmosphere before they can be drawn into an air intake opening. Placing the source of contamination above an air intake takes advantage of the fact that normally encountered sources of contamination are lighter (less dense) than the surrounding air and, therefore, will rise above the vicinity of an air intake located below. Commentary Figure R303.4.1 shows an example of the relative locations for intake air openings for a building where sources of contaminants are present. Particular types of exhausts may have more specific restrictions on their location that would supersede this section. Therefore, **Exception 2** references Chapters 18 and 24 for the termination of vents and chimneys serving fuel-burning appliances and **Exception 3** references Section M1502.3 for the termination of clothes dryer exhaust ducts.*
R303.7 Stairway illumination. All interior and exterior stairways shall be provided with a means to illuminate the stairs, including the landings and treads. Interior stairways shall be provided with an artificial light source located in the immediate vicinity of each landing of the stairway. For interior stairs the artificial light sources shall be capable of illuminating treads and landings to levels not less than 1 footcandle (11 lux) measured at the center of treads and landings. Exterior stairways shall be provided with an artificial light source located in the immediate vicinity of the top landing of the stairway. Exterior stairways providing access to a *basement* from the outside *grade* level shall be provided with an artificial light source located in the immediate vicinity of the bottom landing of the stairway. **Exception:** An artificial light source is not required at the top and bottom landing, provided an artificial light source is located directly over each stairway section.	**R303.7** ~~Stairway~~ **Interior stairway illumination.** ~~All interior and exterior~~ Interior stairways shall be provided with ~~a means~~ an artificial light source to illuminate the ~~stairs, including the~~ landings and treads. ~~Interior stairways shall be provided with an artificial~~ The light source ~~located in the immediate vicinity of each landing of the stairway. For interior stairs the artificial light sources~~ shall be capable of illuminating treads and landings to levels of not less than 1 foot-candle (11 lux) as measured at the center of treads and landings. ~~Exterior stairways~~ There shall be ~~provided with an artificial light source located in the immediate vicinity of the top landing of the stairway. Exterior stairways providing access to~~ a ~~basement from the outside grade~~ a wall switch at each floor level ~~shall be provided with an artificial~~ to control the light source ~~located in the immediate vicinity of the bottom landing of~~ where the stairway has six or more risers. **Exception:** A switch is not required where remote, central, or automatic control of lighting is provided. **R303.8 Exterior stairway illumination.** Exterior stairways shall be provided with an artificial light source located at the top landing of the stairway. Exterior stairways providing access to a basement from the outdoor grade level shall be provided with an artificial light source located at the bottom landing of the stairway.	***City of Houston Amendment*** **Analysis:** ***Code clarification*** – Previous model IRC 2012 Section R303.7 is split into two separate sections. One addressing interior stairway lighting, the other exterior stairway lighting. There are no previous COH amendments in this section. ***No change to the previous technical code requirements or code intent of this section.*** *CHANGE SIGNIFICANCE: Editorial changes to the stairway illumination provisions clarify their application. The requirements for interior and exterior illumination have been placed in separate sections. Interior stairways require illumination of treads and landings. The code no longer prescribes the location of the light source for interior stairways but allows design flexibility in satisfying the minimum illumination level at the walking surface along the entire stairway. Exterior stairways are treated differently, and the code does not prescribe a minimum illumination level. In this case the code requires a light source located at the top landing. In addition, bottom landings require a light source if they provide access to the basement from grade level. The IRC electrical provisions do not address exterior stairway illumination but do require a wall-switch-controlled lighting outlet on the exterior side of each outdoor egress door, including those serving garages.* *Previously, the stairway illumination section began with the general statement that "all interior and exterior stairways shall be provided with a means to illuminate the stairs, including the landings and treads." That language did not align with the specific location requirements later in the section that required a light source at only the top landing of exterior stairs, and in some cases the bottom landing. The conflicting language has been removed.* **Justification:** Amendment needed to ensure conformity with state and local government policy.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
COLOR CODE INDEX: Turquoise = NEW or Modified Text by ICC in 2015; ~~Yellow Strike through~~ = Text Deleted from the Code by COH	**Text Underlined** = COH Amendment added (NEW); Green Text = NEW or Modified Text by COH in 2015	Grey Text = Previous COH Amendment Brought Forward to 2015; ~~Strike through~~ = Text Deleted from the Code by ICC
	 Stairway illumination	
SECTION R304 **MINIMUM ROOM AREAS** **R304.1 Minimum area.** Every *dwelling* unit shall have at least one habitable room that shall have not less than 120 square feet (11 m²) of gross floor area. **R304.2 Other rooms.** Other habitable rooms shall have a floor area of not less than 70 square feet (6.5 m²). **Exception:** Kitchens. **R304.3 Minimum dimensions.** Habitable rooms shall not be less than 7 feet (2,134 mm) in any horizontal dimension. **Exception:** Kitchens. **R304.4 Height effect on room area.** Portions of a room with a sloping ceiling measuring less than 5 feet (1,524 mm) or a furred ceiling measuring less than 7 feet (2,134 mm) from the finished floor to the finished ceiling shall not be considered as contributing to the minimum required habitable area for that room.	**SECTION R304** **MINIMUM ROOM AREAS** **R304.1 Minimum area.** ~~Every dwelling unit shall have at least one habitable room that shall have not less than 120 square feet (11 m²) of gross floor area.~~ **~~R304.2 Other rooms.~~** ~~Other~~ Habitable rooms shall have a floor area of not less than 70 square feet (6.5 m²). **Exception:** Kitchens. **R304.2 Minimum dimensions.** Habitable rooms shall be not less than 7 feet (2,134 mm) in any horizontal dimension. **Exception:** Kitchens. **R304.3 Height effect on room area.** Portions of a room with a sloping ceiling measuring less than 5 feet (1,524 mm) or a furred ceiling measuring less than 7 feet (2,134 mm) from the finished floor to the finished ceiling shall not be considered as contributing to the minimum required habitable area for that room.  Small dwelling complying with minimum area requirements	***City of Houston Amendment*** **Analysis:** The model code is changed to reduce the minimum size for specific rooms. There are no previous IRC 2012 COH amendments in section. *CHANGE SIGNIFICANCE: The IRC sets minimum requirements for a healthy interior living environment, including provisions for room size, ceiling height, light, ventilation, and heating. The code has long provided a minimum room area of 120 square feet for at least one habitable room with all other habitable rooms having a floor area not less than 70 square feet. Most modern homes have rooms that exceed those dimensions, but the intent has been to at least provide a small 12-foot by 10-foot living room with one or more bedrooms measuring approximately 7 feet by 10 feet. The requirement for one habitable room with a minimum floor area of 120 square feet has been removed from the code. The 70-square-foot minimum area now applies to all habitable rooms as the smallest acceptable size for occupants to move about and use the habitable space as intended. The minimum area of 120 square feet was not based on scientific analysis or on identified safety hazards but was generally accepted by code users and in the marketplace. Recently, however, proponents of minimalist living have advocated smaller dwellings to reduce environmental impact and provide for lower living costs through reduced mortgage and maintenance expenses. These dwellings are intended to allow for a minimalist lifestyle that doesn't demand large volumes of living space. Extreme examples of these minimalist dwellings are often termed "tiny houses." Proponents of this change reasoned that consumers make a purposeful and informed decision as to the appropriateness of the housing they choose to live in and that the code should not place arbitrary restrictions on room size that have no demonstrable life-safety benefit. Although the change will not impact typical residential construction, it will accommodate alternatives for very small dwellings that would previously not be allowed under the IRC. It may also encourage greater acceptance of and compliance with the residential code by those pursuing a minimalist lifestyle.* **Justification:** This amendment was reformatted and absorbed into 311.1.1 in the 2015 IRC due to changes in the base code.
SECTION R305 **CEILING HEIGHT**	**SECTION R305** **CEILING HEIGHT**	***City of Houston Amendment***

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
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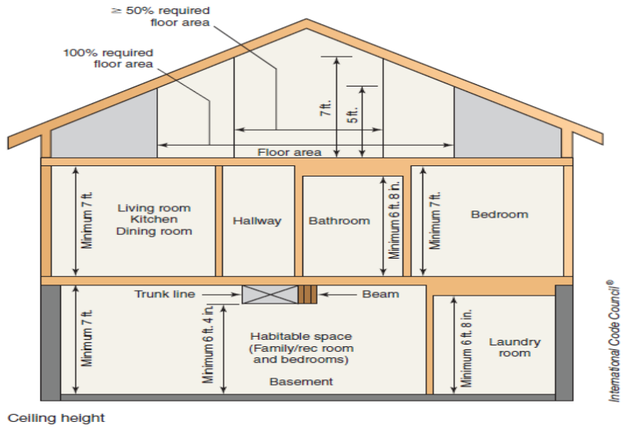
R305.1 Minimum height. *Habitable space*, hallways, bathrooms, toilet rooms, laundry rooms and portions of *basements* containing these spaces shall have a ceiling height of not less than 7 feet (2,134 mm).

Exceptions:

1. For rooms with sloped ceilings, at least 50 percent of the required floor area of the room must have a ceiling height of at least 7 feet (2,134 mm) and no portion of the required floor area may have a ceiling height of less than 5 feet (1,524 mm).
2. Bathrooms shall have a minimum ceiling height of 6 feet 8 inches (2,032 mm) at the center of the front clearance area for fixtures as shown in Figure R307.1. The ceiling height above fixtures shall be such that the fixture is capable of being used for its intended purpose. A shower or tub equipped with a showerhead shall have a minimum ceiling height of 6 feet 8 inches (2,032 mm) above a minimum area 30 inches (762 mm) by 30 inches (762 mm) at the showerhead.

R305.1.1 Basements. Portions of *basements* that do not contain *habitable space*, hallways, bathrooms, toilet rooms and laundry rooms shall have a ceiling height of not less than 6 feet 8 inches (2,032 mm).

Exception: Beams, girders, ducts, or other obstructions may project to within 6 feet 4 inches (1,931 mm) of the finished floor.



Ceiling height

R305.1 Minimum height. Habitable space, hallways, ~~bathrooms, toilet rooms, laundry rooms~~ and portions of basements containing these spaces shall have a ceiling height of not less than 7 feet (2,134 mm). Bathrooms, toilet rooms, and laundry rooms shall have a ceiling height of not less than 6 feet 8 inches (2,032 mm).

Exceptions:

1. For rooms with sloped ceilings, the required floor area of the room must have a ceiling height of not less than 5 feet (1,524 mm) and not less than 50 percent of the required floor area shall have a ceiling height of not less than 7 feet (2,134 mm). ~~at least 50 percent of the required floor area of the room must have a ceiling height of at least 7 feet (2,134 mm) and no portion of the required floor area may have a ceiling height of less than 5 feet (1,524 mm).~~
2. ~~Bathrooms shall have a minimum ceiling height of 6 feet 8 inches (2,032 mm) at the center of the front clearance area for fixtures as shown in Figure R307.1.~~ The ceiling height above bathroom and toilet room fixtures shall be such that the fixture is capable of being used for its intended purpose. A shower or tub equipped with a showerhead shall have a ~~minimum~~ ceiling height of not less than 6 feet 8 inches (2,032 mm) above an ~~minimum~~ area not less than 30 inches (762 mm) by 30 inches (762 mm) at the showerhead.
3. Beams, girders, ducts, or other obstructions in basements containing habitable space shall be permitted to project to within 6 feet 4 inches (1931 mm) of the finished floor.

R305.1.1 Basements. Portions of basements that do not contain habitable space~~,~~ or hallways~~, bathrooms, toilet rooms and laundry rooms~~ shall have a ceiling height of not less than 6 feet 8 inches (2032 mm).

Exception: At ~~B~~beams, girders, ducts, or other obstructions, the ceiling height shall be not less than ~~may project to within~~ 6 feet 4 inches (1931 mm) ~~of~~ from the finished floor.

Analysis: The model code provisions for these two sections are expanded to allow lower ceiling heights in specific rooms or areas not considered habitable rooms. There are no previous IRC 2012 COH amendments in these sections.

CHANGE SIGNIFICANCE: The exceptions to the minimum 7-foot ceiling height have been expanded in relation to bathrooms, toilet rooms, and basements. Laundry rooms have been added to the list of exceptions allowing a lower ceiling height. In previous editions, the code has recognized that the areas in front of plumbing fixtures and in showers may have ceiling heights of 6 feet, 8 inches without impairing the function of the space. The intent is that bathrooms are not habitable space, and a lower ceiling height does not cause any safety or health hazard, or inconvenience to the occupants. Proponents of the change reasoned that there was no justification to limit the exception to the area around plumbing fixtures. With that in mind, the code now permits the entire bathroom or toilet room to have a lower ceiling height of 6 feet, 8 inches. For other than showers, the code does not set a ceiling height requirement above bathroom and toilet room fixtures provided the fixtures can be used. Because laundry rooms also are not habitable space and have a temporary use like bathrooms, they are now included in the exception for the lower ceiling height. Most modern homes exceed the minimum ceiling height requirements and the provisions for 7-foot and 6-foot, 8-inch ceilings more often come into play during remodeling of existing homes.

The code has long given special consideration to unfinished basements, those without habitable space, hallways, and bathrooms, for example. The 2015 IRC maintains the provisions for a reduced ceiling height of 6 feet, 8 inches for basements without habitable space or hallways. There is no longer a need to mention bathrooms, toilet rooms, and laundry rooms when considering basement ceiling height because these rooms now also permit a ceiling height of 6 feet, 8 inches. Basements often have support beams and ductwork below the floor system above, and the code provides for a minimum ceiling height of 6 feet, 4 inches below these and other similar obstructions. In previous editions, the IRC limited the exception for projections to basements without habitable space. This can present problems when the basement is finished off to include habitable space such as a family room or recreation room and the ceiling height under these projections no longer follows the code. For this reason, the code now allows a 6-foot, 4-inch height below beams, girders, ducts, or other obstructions in basements containing habitable space. With this language added, the designer can establish the ceiling height of an unfinished basement at 7 feet, while setting the beam height at 6 feet, 4 inches above the finished floor, thereby allowing for the basement to be converted to habitable space in the future.

Justification: This amendment was reformatted and absorbed into 311.1.1 in the 2015 IRC due to changes in the base code.

R308.4.2 Glazing adjacent to 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 where the bottom exposed edge of the glazing is less than 60 inches (1,524 mm) above the floor or walking surface shall be considered a hazardous location.

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.

R308.4.2 Glazing adjacent to doors. Glazing in an individual fixed or operable panel adjacent to a door shall be considered to be a hazardous location where the bottom exposed edge of the glazing is less than 60 inches (1,524 mm) above the floor or walking surface and it meets either of the following conditions:

1. Where the glazing is within 24 inches (610 mm) of either side of the door in the plane of the door in a closed position.
2. Where the glazing is on a wall perpendicular to the plane of the door in a closed position and within 24 inches (610 mm) of the hinge side of an in-swinging door.

Exceptions:

1. Decorative glazing.

City of Houston Amendment

Analysis: The previous IRC 2012 COH amendment in Section R310.1.5 was deleted and relocated to the provisions of IRC 2015 Section R311.1.1.

CHANGE SIGNIFICANCE: Traditionally, the code has provided that glazing installed less than 24 inches from a door in the closed position required safety glazing unless the lowest edge of the glazing was at least 60 inches above the floor. This most often applies to door sidelights and windows installed in the same wall and therefore in the same plane as the door. The application of the code in this case is straightforward and easily understood. The hazard was more difficult to identify for windows installed perpendicular to the plane of the door. The general rule for safety glazing applied to glazing installed within 24 inches of the door, but Exception 3 exempted glazing on the latch side of and perpendicular to a door, regardless of door swing. To most code users, this meant that an adjacent window installed perpendicular to the door and on the hinge side required safety glazing, even if the door swing was away

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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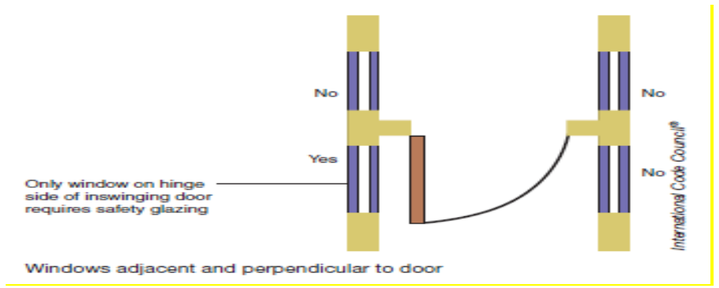
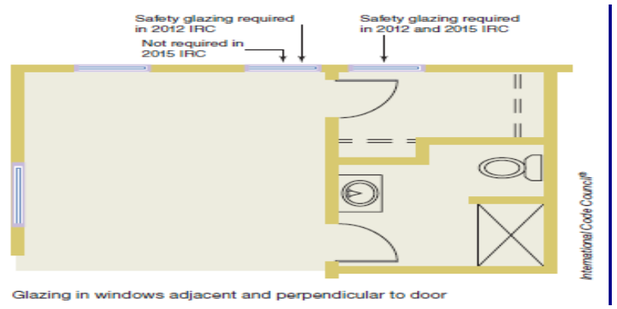
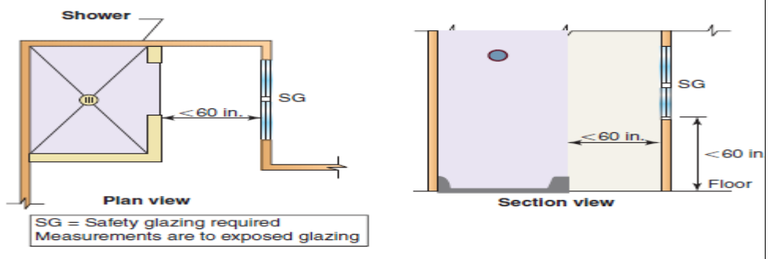
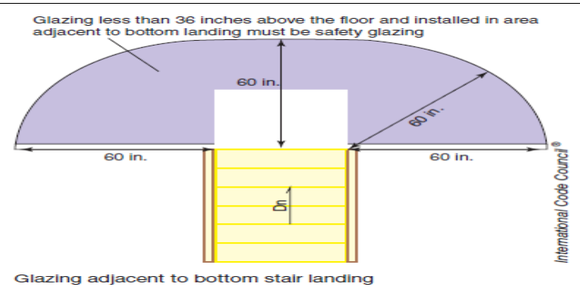
4. Where access through the door is to a closet or storage area 3 feet (914 mm) or less in depth. Glazing in this application shall comply with section R308.4.3. **5.** Glazing that is adjacent to the fixed panel of patio doors.  Windows adjacent and perpendicular to door	**2.** Where there is an intervening 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.** 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~~4~~.** Glazing that is adjacent to the fixed panel of patio doors.  Glazing in windows adjacent and perpendicular to door	*from the window. With the door swinging away from the glazing and the glazing installed parallel to the direction of travel (perpendicular to the door), it was difficult to explain the hazard and justify the requirement for safety glazing. The revised language identifies the hazard of someone being pushed into the glazing when the door swings open. Therefore, for glazing installed perpendicular to a door, the code now identifies only one position as a hazardous location—where the window is located on the hinge side and the door swings in the direction of the glazing. To prevent injury to a person being pushed into or through the window in this position, safety glazing is required.* **Justification:** This amendment was reformatted and absorbed into 311.1.1 in the 2015 IRC due to changes in the base code.
R308.4.5 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 (1,524 mm) measured vertically above any standing or walking surface shall be considered a hazardous location. This shall apply to single glazing and each pane in multiple glazing. **Exception:** Glazing that is more than 60 inches (1,524 mm), measured horizontally and in a straight line, from the water's edge of a bathtub, hot tub, spa, whirlpool, or swimming pool.	**R308.4.5 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 (1,524 mm) measured vertically above any standing or walking surface shall be considered to be a hazardous location. This shall apply to single glazing and each pane in multiple glazing. **Exception:** Glazing that is more than 60 inches (1,524 mm), measured horizontally and in a straight line, from the water's edge of a bathtub, hot tub, spa, whirlpool, or swimming pool or from the edge of a shower, sauna, or steam room.  Glazing facing shower	***City of Houston Amendment*** **Analysis:** The previous IRC 2012 model code provisions include minor editorial changes. *CHANGE SIGNIFICANCE: In the reorganization of the safety glazing provisions in the last two code cycles, the language for determining a hazardous location for glazing adjacent to swimming pools and hot tubs was adapted to the provisions for bathtubs and showers and similar locations. In the 2012 IRC, the provisions for bathtubs, showers, and swimming pools were combined into one section titled "Glazing and Wet Surfaces." The change clarified that the code was regulating the area inside as well as outside and adjacent to bathtubs and showers as a slipping hazard requiring safety glazing. Regarding glazing, the hazardous location for swimming pool decks has traditionally been defined as a location less than 60 inches horizontally from the water's edge. For glazing installed 60 inches or more from the water's edge, safety glazing has not been required. This exception for a 60-inch horizontal distance was applied to bathtubs and whirlpool tubs. Inadvertently, showers were omitted from the exception, although the intent was the same—to exempt glazing that was at least 60 inches away from a shower. In defining a hazardous location as the wet surface adjacent to a laundry list of fixtures, it is reasonable to expect that the exception for a safe distance away from the hazard should match that list in the main section. The code now recognizes that glazing installed 60 inches or greater from the edge of a shower, sauna, or steam room does not require safety glazing, the same distance that applies when measuring from the water's edge of a bathtub, hot tub, spa, whirlpool, or swimming pool.* **Justification:** This amendment was reformatted and absorbed into 311.1.1 in the 2015 IRC due to changes in the base code.
R308.4.7 Glazing adjacent to the bottom stair landing. Glazing adjacent to 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 (1,524 mm) horizontally of the bottom tread shall be considered a hazardous location. **Exception:** 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.	**R308.4.7 Glazing adjacent to the bottom stair landing**. Glazing adjacent to the landing at the bottom of a stairway where the glazing is less than 36 inches (914 mm) above the landing and within a 60-inch~~es~~ (1,524 mm) ~~horizontally of~~ horizontal arc less than 180 degrees from the bottom tread nosing shall be considered to be a hazardous location. **Exception:** 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.	***City of Houston Amendment*** **Analysis:** The previous IRC 2012 model code Section R308.4.7 now includes minor changes that clarify requirements. Glazing adjacent to the bottom stair landing is now defined as the area in front of the plane of the bottom tread. There was no previous COH amendment in Section R308.4.7. *CHANGE SIGNIFICANCE: Based on a concern that the code might be misapplied to require safety glazing in an area that was behind the horizontal plane of the nose of the bottom tread, the new language intends to better define the area adjacent to the bottom stair landing that is considered a hazardous location for glazing. As an occupant walks down a stair, the hazard of falling into and breaking glazing occurs in the bottom landing area in front of and to either side of the direction of travel beyond the bottom*



Glazing adjacent to bottom stair landing

tread. It is unlikely that a person would fall into glazing that was placed behind the plane of the bottom tread. Section R308.4.6 regulates glazing at the sides of stairs.

Justification: This amendment was reformatted and absorbed into 311.1.1 in the 2015 IRC due to changes in the base code.

SECTION R310
EMERGENCY ESCAPE AND RESCUE OPENINGS

R310.1 Emergency escape and rescue required. *Basements,* habitable attics, and 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 (1,118 mm) measured from the finished floor to the bottom of the clear opening. 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.

Exception: *Basements* used only to house mechanical *equipment* and not exceeding total floor area of 200 square feet (18.58 m^2).

R310.1.1 Minimum opening area. All emergency escape and rescue openings shall have a minimum net clear opening of 5.7 square feet (0.530 m^2).

Exception: *Grade* floor openings shall have a minimum net clear opening of 5 square feet (0.465 m^2).

R310.1.2 Minimum opening height. The minimum net clear opening height shall be 24 inches (610 mm).

R310.1.3 Minimum opening width. The minimum net clear opening width shall be 20 inches (508 mm).

R310.1.4 Operational constraints. Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys, tools, or special knowledge.

R310.2 Window wells. The minimum horizontal area of the window well shall be 9 square feet (0.9 m^2), with a minimum horizontal projection and width of 36 inches (914 mm). The area of the window well shall allow the emergency escape and rescue opening to be fully opened.

SECTION R310
EMERGENCY ESCAPE AND RESCUE OPENINGS

R310.1 Emergency escape and rescue opening required. Basements, habitable attics, and every sleeping room shall have not less than one operable emergency escape and rescue opening. Where basements contain one or more sleeping rooms, an emergency escape and rescue opening shall be required in each sleeping room. Emergency escape and rescue openings shall open directly into a public way, or to a yard or court that opens to a public way.

Exception: Storm shelters and basements used only to house mechanical equipment not exceeding a total floor area of 200 square feet (18.58 m^2)

R310.1.1 Operational constraints and Opening Control Devices. Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys, tools, or special knowledge. Window opening control devices complying with ASTM F 2090 shall be permitted for use on windows serving as a required emergency escape and rescue opening.

R310.2 Emergency escape and rescue openings. Emergency escape and rescue openings shall have minimum dimensions as specified in this section.

R310.2.1 Minimum opening area. All emergency and escape rescue openings shall have a net clear opening of not less than 5.7 square feet (0.530 m^2). 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. The net clear height opening shall be not less than 24 inches (610 mm) and the net clear width shall be not less than 20 inches (508 mm).

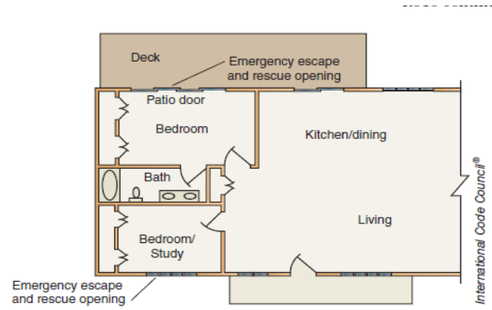
Exception: Grade floor or below-grade openings shall have a net clear opening of not less than 5 square feet (0.465 m^2).

R310.2.2 Windowsill height. Where a window is provided as the emergency escape and rescue opening, it shall have a sill height of not more than 44 inches (1,118 mm) above the floor; where the sill height is below grade, it shall be provided with a window well in accordance with Section R310.2.3.

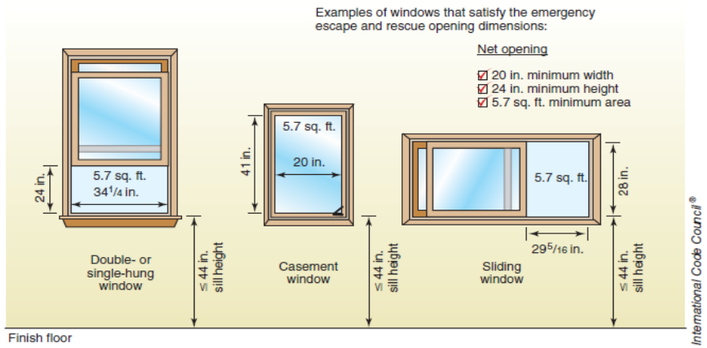
R310.2.3 Window wells. The horizontal area of the window well shall be not less than 9 square feet (0.9 m^2), with a horizontal projection and width of not less than 36 inches (914 mm). The area of the window well shall allow the emergency escape and rescue opening to be fully opened.

City of Houston Amendment

Analysis: ***Clarification –*** No technical changes made to the previous code requirements. This section of the model code was expanded extensively and reorganized in the IRC 2015 and now includes changes that clarify requirements. Including specific provisions to address doors used as emergency escape and rescue openings. There was no previous COH amendment in Section R310.



Typical use of patio doors and windows as emergency escape and rescue openings



Emergency escape and rescue windows

CHANGE SIGNIFICANCE: There are no intended technical changes in the reorganization of the emergency escape and rescue provisions in Sections R310.1 through R310.4. (New provisions for existing buildings are addressed in the next change in this publication.) Specific language related to doors used for emergency escape and rescue openings has been added, but there are no changes to the opening dimension requirements. Because exterior doors are typically much larger than the required dimensions for the net opening, they have always been acceptable for satisfying the emergency escape

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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Exception: The ladder or steps required by Section R310.2.1 shall be permitted to encroach a maximum of 6 inches (152 mm) into the required dimensions of the window well.

R310.2.1 Ladder and steps. Window wells with a vertical depth greater than 44 inches (1,118 mm) shall be equipped with a permanently affixed ladder or steps usable with the window in the fully open position. Ladders or steps required by this section shall not be required to comply with Sections R311.7 and R311.8. Ladders or rungs shall have an inside width of at least 12 inches (305 mm), shall project at least 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the window well.

R310.2.2 Drainage. Window wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section R405.1 or by an approved alternative 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.

R310.3 Bulkhead enclosures. Bulkhead enclosures shall provide direct access to the *basement*. The bulkhead enclosure with the door panels in the fully open position shall provide the minimum net clear opening required by Section R310.1.1. Bulkhead enclosures shall also comply with Section R311.7.10.2.

R310.4 Bars, grilles, covers and screens. Bars, grilles, covers, screens or similar devices are permitted to be placed over emergency escape and rescue openings, bulkhead enclosures, or window wells that serve such openings, provided the minimum net clear opening size complies with Sections R310.1.1 to R310.1.3, and such devices shall be releasable or removable from the inside without the use of a key, tool, special knowledge or force greater than that which is required for normal operation of the escape and rescue opening.

R310.5 Emergency escape windows under decks and porches. Emergency escape windows are allowed to be installed under decks and porches provided the location of the deck allows the emergency escape window to be fully opened and provides a path not less than 36 inches (914 mm) in height to a *yard* or court.

Exception: The ladder or steps required by Section R310.2.3.1 shall be permitted to encroach not more than 6 inches (152 mm) into the required dimensions of the window well.

R310.2.3.1 Ladder and steps. Window wells with a vertical depth greater than 44 inches (1,118 m) shall be equipped with a permanently affixed ladder or steps usable with the window in the fully open position. Ladders or steps required by this section shall not be required to comply with Sections R311.7 and R311.8. Ladders or rungs shall have an inside width of not less than 12 inches (305 mm), shall project not less than 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the window well.

R310.2.3.2 Drainage. Window wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section R405.1 or by an approved alternative 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.

R310.2.4 Emergency escape and rescue openings under decks and porches. Emergency escape and rescue openings shall be permitted to be installed under decks and porches provided the location of the deck allows the emergency escape and rescue openings to be fully opened and provides a path not less than 36 inches (914 mm) in height to a yard or court.

R310.3 Emergency escape and rescue doors. Where a door is provided as the required emergency escape and rescue opening, it shall be permitted to be a side hinged door or a slider. Where the opening is below the adjacent ground elevation, it shall be provided with a bulkhead enclosure.

R310.3.1 Minimum door opening size. The minimum net clear height opening for any door that serves as an emergency and escape rescue opening shall be in accordance with Section R310.2.1.

R310.3.2 Bulkhead enclosures. Bulkhead enclosures shall provide direct access from the basement. The bulkhead enclosure shall provide the minimum net clear opening equal to the door in the fully open position.

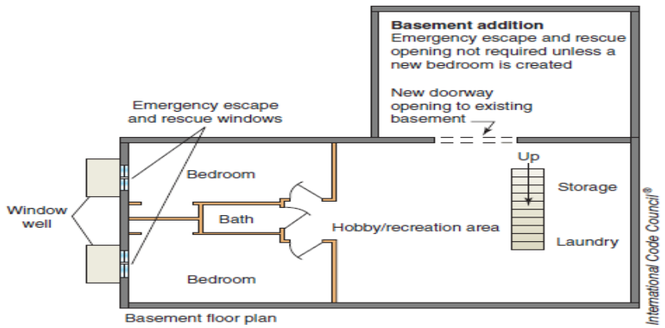
R310.3.2.1 Drainage. Bulkhead enclosures shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section R405.1 or by an approved alternative method.

Exception: A drainage system for bulkhead enclosures 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.

R310.4 Bars, grilles, covers, and screens. Bars, grilles, covers, screens or similar devices are permitted to be placed over emergency escape and rescue openings, bulkhead enclosures, or window wells that serve such openings, provided the minimum net clear opening size complies with Sections R310.1.1 to R310.2.3, and such devices shall be releasable or removable from the inside

and rescue opening requirements. The reorganization addresses windows and doors separately to avoid any confusion. Section R310.1.1 clarifies that window opening control devices complying with ASTM F 2090 are approved for use on windows serving as a required emergency escape and rescue opening. Window opening control devices are one option for satisfying the window fall protection requirements of Section R312.2. The device limits the operation of the window such that the net opening does not permit a 4-inch sphere to pass through but has a quick-release mechanism that is approved for emergency escape and rescue. Window opening control devices must comply with ASTM F 2090, Specification for Window Fall Prevention Devices—with Emergency Escape (Egress) Release Mechanisms.

Justification: This code provisions were reorganized by the model code publisher.

	without the use of a key, tool, special knowledge, or force greater than that which is required for normal operation of the escape and rescue opening.	
N/A  A basement addition does not require an emergency escape and rescue opening if access is provided to the existing basement.	**R310.5 Dwelling additions.** Where dwelling additions occur that contain sleeping rooms, an emergency escape and rescue opening shall be provided in each new sleeping room. Where dwelling additions occur that have basements, an emergency escape and rescue opening shall be provided in the new basement. **Exceptions:** **1.** An emergency escape and rescue opening is not required in a new basement that contains a sleeping room with an emergency escape and rescue opening. **2.** An emergency escape and rescue opening is not required in a new basement where there is an emergency escape and rescue opening in an existing basement that is accessible from the new basement. **R310.6 Alterations or repairs of existing basements.** An emergency escape and rescue opening is not required where existing basements undergo alterations or repairs. **Exception:** New sleeping rooms created in an existing basement shall be provided with emergency escape and rescue openings in accordance with Section R310.1.	***City of Houston Amendment*** **Analysis:** The basement of a dwelling addition does not require an emergency escape and rescue opening if there is access to a basement that does have an emergency escape and rescue opening. Remodeling of an existing basement does not trigger the emergency escape and rescue opening requirements unless a new bedroom is created. *CHANGE SIGNIFICANCE: The new sections addressing emergency escape and rescue openings in existing buildings intend to clarify the correct application of the code during remodeling and construction of dwelling additions. Remodeling of a basement does not trigger a requirement to install an emergency escape and rescue opening. Only the creation of a new bedroom requires installation of an emergency escape and rescue opening. Constructing a new basement is subject to the applicable requirements in the code and an emergency escape and rescue opening is required. The exception recognizes that the appropriate level of safety is achieved if there is an existing emergency escape and rescue opening in the existing basement and access is provided to the existing basement.* **Justification:** This amendment was reformatted and absorbed into 311.1.1 in the 2015 IRC due to changes in the base code.
R310.1.5 Yards and courts. Yards and courts shall not be less than 3 feet (914 mm) in width. **Exception:** Projections shall not reduce the clear width to less than 32 inches (813 mm) up to 80 inches (2,032 mm) above the floor or ground.	**N/A – Reference 2015 IBC Section 1206.2** **2015 IBC Excerpts:** **1206.2 Yards.** Yards shall be not less than 3 feet (914 mm) in width for buildings two stories or less above grade plane. For buildings more than two stories above grade plane, the minimum width of the yard shall be increased at the rate of 1 foot (305 mm) for each additional story. For buildings exceeding 14 stories above grade plane, the required width of the yard shall be computed on the basis of 14 stories above grade plane. **1206.3 Courts.** Courts shall be not less than 3 feet (914 mm) in width. Courts having windows opening on opposite sides shall be not less than 6 feet (1829 mm) in width. Courts shall be not less than 10 feet (3048 mm) in length unless bounded on one end by a public way or yard. For buildings more than two stories above grade plane, the court shall be increased 1 foot (305 mm) in width and 2 feet (610 mm) in length for each additional story. For buildings exceeding 14 stories above grade plane, the required dimensions shall be computed on the basis of 14 stories above grade plane. **1206.3.1 Court access.** Access shall be provided to the bottom of courts for cleaning purposes. **1206.3.2 Air intake.** Courts more than two stories in height shall be provided with a horizontal air intake at the bottom not less than 10 square feet (0.93 m2) in area and leading to the exterior of the building unless abutting a yard or public way. **1206.3.3 Court drainage.** The bottom of every court shall be properly graded and drained to a public sewer or other approved disposal system complying with the International Plumbing Code.	***City of Houston Amendment*** **Analysis:** The previous IRC 2012 COH amendment in Section R310.1.5 was deleted and relocated to IRC 2015 Section R311.1.1. Additional code provisions minimum dimensions, other requirements are provided in the model code of the IBC. **Justification:** This amendment was reformatted and absorbed into 311.1.1 in the 2015 IRC due to changes in the base code.
SECTION R311	**SECTION R311**	***City of Houston Amendment***

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
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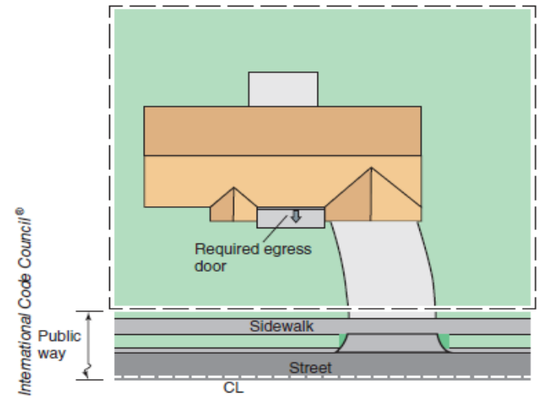
MEANS OF EGRESS **R311.1 Means of egress.** All *dwellings* shall be provided with a means of egress as provided in this section. The means of egress shall provide a continuous and unobstructed path of vertical and horizontal egress travel from all portions of the *dwelling* to the exterior of the *dwelling* at the required egress door without requiring travel through a garage.	**MEANS OF EGRESS** **R311.1 Means of egress.** ~~All d~~Dwellings shall be provided with a means of egress ~~as provided~~ in accordance with this section. The means of egress shall provide a continuous and unobstructed path of vertical and horizontal egress travel from all portions of the dwelling to the ~~exterior of the dwelling at the~~ required egress door without requiring travel through a garage. The required egress door shall open directly into a public way or to a yard or court that opens to a public way.  © Lindasj22/Shutterstock.com. Dwelling with front-yard access to a public way	**Analysis:** The previous IRC 2012 COH amendment in Section R310.1.5 was deleted and relocated to the provisions of IRC 2015 Section R311.1.1.  The required egress door must have access to a public way. *CHANGE SIGNIFICANCE: Proponents of this change reasoned that the means of egress should not have less restrictive requirements than those for emergency escape and rescue openings, which are required to open to a public way or to a yard or court that leads to a public way. The new language is consistent with Section R310.1. In practice, almost all new homes exit to a yard that has access to a public sidewalk or street, and this clarification to the code is not likely to impact construction.* **Justification:** This amendment was reformatted and absorbed into 311.1.1 in the 2015 IRC due to changes in the base code.
R310.1.5 Yards and courts. The means of egress shall provide a continuous and unobstructed path of egress travel to a public way. **Exception:** Projections shall not reduce the clear width to less than 32 inches (813 mm) up to 80 inches (2,032 mm) above the floor or ground.	**R311.1.1 Yards and courts.** Yards and courts shall not be less than 3 feet (914 mm) in width and shall be open to a continuous and unobstructed path of egress travel to a public way. **Exception:** Projections shall not reduce the clear width to less than 32 inches (813 mm) up to 80 inches (2,032 mm) above the floor or ground.	***City of Houston Amendment*** **Analysis:** The previous IRC 2012 COH amendment in Section R310.1.5 was relocated to this Section R311.1.1. This COH amendment is to clarify the code intent and to assist the code users. Additional code provisions minimum dimensions, other yard and court requirements are provided in the model code of the IBC. **Justification:** The modification of this amendment was needed to ensure that previous code amendments pertaining to means of egress remained a part of the code.
R311.7.5.1 Risers. The maximum riser height shall be 7 ¾-inches (196 mm). The riser shall be measured vertically between leading edges of the adjacent treads. The greatest riser height within any flight of stairs shall not exceed the smallest by more than 3/8 inch (9.5 mm). Risers shall be vertical or sloped from the underside of the nosing of the tread above at an angle not more than 30 degrees (0.51 rad) from the vertical. Open risers are permitted provided that the opening between treads does not permit the passage of a 4-inch-diameter (102 mm) sphere. **Exception:** The opening between adjacent treads is not limited on stairs with a total rise of 30 inches (762 mm) or less.	**R311.7.5.1 Risers.** The ~~maximum~~ riser height shall be not more than 7 ¾-inches (196 mm). The riser shall be measured vertically between leading edges of the adjacent treads. The greatest riser height within any flight of stairs shall not exceed the smallest by more than 3/8 inch (9.5 mm). Risers shall be vertical or sloped from the underside of the nosing of the tread above at an angle not more than 30 degrees (0.51 rad) from the vertical. Open risers are permitted provided that the openings ~~between treads~~ located more than 30 inches (762 mm), as measured vertically, to the floor or grade below do~~es~~ not permit the passage of a 4-inch-diameter (102 mm) sphere. **Exceptions:** 1. The opening between adjacent treads is not limited on ~~stairs with a total rise of 30 inches (762 mm) or less~~ spiral stairways.	***City of Houston Amendment*** **Analysis:** The total vertical rise in a stairway without an intermediate landing has increased in the 2015 IRC from 144 inches to 147 inches. The provision for allowing open risers has been clarified. It is based on the distance above grade or the floor below, not on the total rise of the stair. A new exception clarifies that open risers are permitted on spiral stairways. There was no previous COH amendment to this section. *CHANGE SIGNIFICANCE: The code limits the total rise between landings in a stair. Traditionally, that vertical distance has been 12 feet before a landing is required for the user to pause and rest when climbing a high stair. This is typically not an issue in conventional home construction because the story height—the distance from one floor surface to the floor above—does not usually exceed 12 feet. However, with open floor plans, long-span engineered wood floor systems of greater depth, and high ceilings, story height can exceed 12 feet and an intermediate landing is required. In the 2015 IRC, the 12-foot limit has been increased by 3 inches to 147 inches. The elevation of 147 inches is a multiple of the maximum riser height of 7¾ inches (19 risers 3 7.75 inches 5 147.25 inches). This minor change of just 3 inches in the total rise of the flight will in some cases eliminate the cost of incorporating a landing and the additional*

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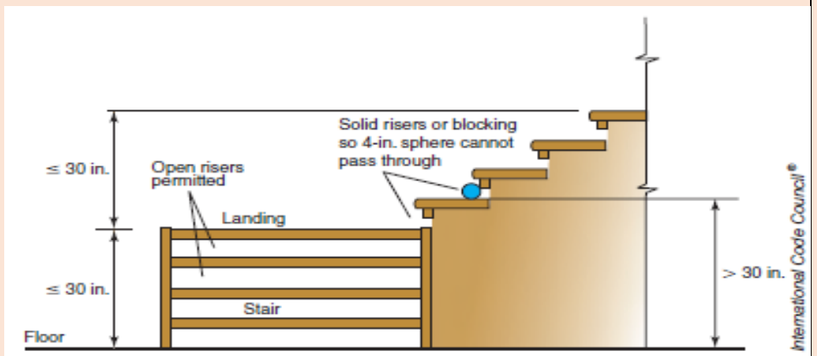
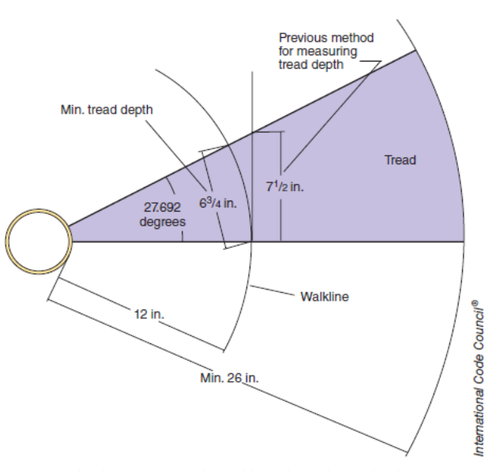
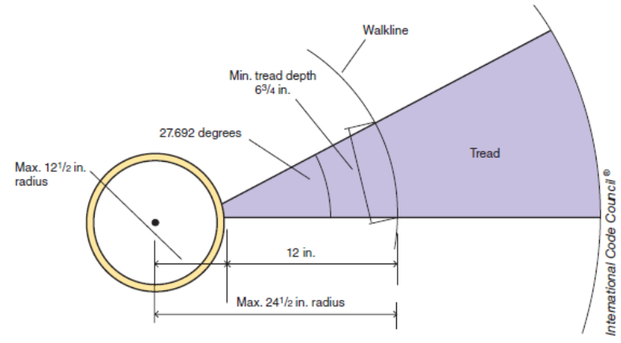
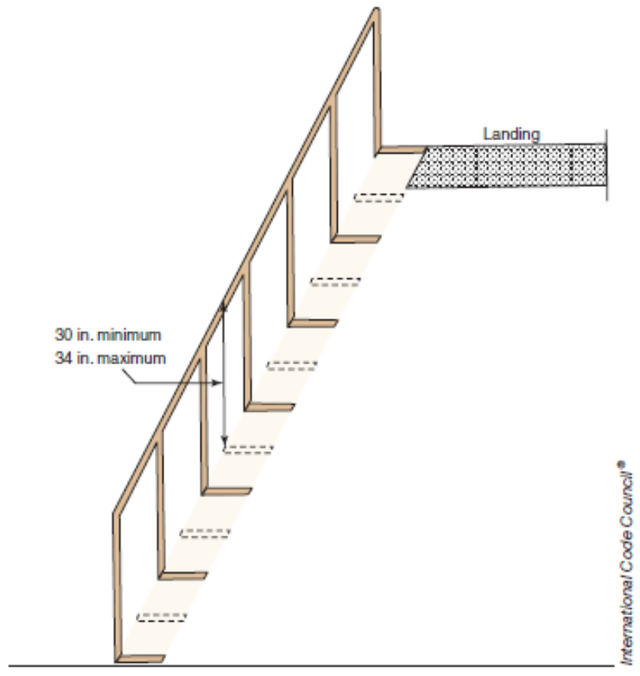
	2. The riser height of spiral stairways shall be in accordance with Section R311.7.10.1.  Open risers are only permitted when they are 30 inches or less above the floor.	*space required, reducing construction costs. This represents no discernible difference consequential to the user. The change to the 147-inch dimension provides a direct relationship between the total vertical rise and the maximum riser height requirements.* *The change to the open riser exception clarifies that the fall hazard is based on the distance to the grade or floor below, not the total rise of an individual flight of stairs. The previous exception allows unrestricted openings in risers if the stair flight has a 30-inch total rise. Flights stacked in a well could each have a total rise of 30 inches and an exposure to a much greater fall distance to the next level or flight below. The exception has been removed and the mandatory language found in Section R312, "Guards and Window Fall Protection," is placed in the main section. Stairs located more than 30 inches above the floor or grade below require solid risers or must be constructed such that a 4-inch-diameter sphere cannot pass through. The code permits larger openings between treads of stairs located 30 inches or less above the surface below.* *Spiral stairways typically are constructed with open risers. Although the International Building Code (IBC) states that solid risers are not required for spiral stairways, the IRC has not previously addressed this riser provision. An exception has been added to Section R311.7.5.1 to clarify that there are no restrictions for openings between the treads of spiral stairways.* **Justification:** The modification of this amendment was needed to ensure that previous code amendments pertaining to means of egress remained a part of the code.
R311.7.10 Special stairways. Spiral stairways and bulkhead enclosure stairways shall comply with all requirements of Section R311.7 except as specified below. **R311.7.10.1 Spiral stairways.** Spiral stairways are permitted, provided the minimum clear width at and below the handrail shall be 26 inches (660 mm) with each tread having a 7 ½-inch (190 mm) minimum tread depth at 12 inches (914 mm) from the narrower edge. All treads shall be identical, and the rise shall be no more than 9 ½-inches (241 mm). A minimum headroom of 6 feet 6 inches (1,982 mm) shall be provided.	**R311.7.10 Special stairways.** Spiral stairways and bulkhead enclosure stairways shall comply with the requirements of Section R311.7 except as specified in Sections R311.7.10.1 and R311.7.10.2. **R311.7.10.1 Spiral stairways.** Spiral stairways are permitted, provided that the ~~minimum~~ clear width at and below the handrail ~~shall be~~ is not less than 26 inches (660 mm) ~~with~~ and the walk line radius is not greater than 24. inches (622 mm). ~~e~~Each tread ~~having~~ shall have a ~~7 ¾-inch (190 mm) minimum~~ tread depth ~~at 12 inches (914 mm) from the narrower edge~~ of not less than 6. inches (171 mm) at the walk line. All treads shall be identical, and the rise shall be not more than 9 ½-inches (241 mm). ~~A minimum~~ Headroom shall be not less than 6 feet, 6 inches (1,982 mm) ~~shall be provided~~.  Measuring the tread of spiral stairs at the intersection of the tread nosings and the walkline	***City of Houston Amendment*** **Analysis:** The code adds a definition of spiral stairway that omits any requirement for a center post to allow for design flexibility. The code now limits the size of spiral stairways by restricting the radius at the walk line to a dimension not greater than 24 ½-inches. The method of measurement for tread depth now matches the winder provisions and measures at the intersection of the walk line and the tread nosing's rather than perpendicular to the leading edge of the tread.  Maximum walkline radius for a spiral stairway *CHANGE SIGNIFICANCE: Spiral stairways provide a space-saving alternative and are permitted to serve any portion of a dwelling as part of the means of egress. Due to their narrow, winding design, they are considered safe for use with less headroom, taller risers, and treads that are narrower at the walk line than conventional stairs. In previous editions of the code, spiral stairways were not restricted in size. The revised provisions define a reasonable limit of the radius at the walk line for the design of spiral stairways, while still maintaining the exceptions for headroom, riser height, and tread depth when compared to conventional stairs. Stairs beyond the limit stated would be considered curved stairs. This change correlates with the new IRC definition of spiral stairway, which omits any reference to a supporting column as found in the IBC. The other change to this section is largely editorial. Treads within spiral stairways meet the definition of winder treads and are sometimes interpreted to be measured for tread depth in the same fashion. This change simply adjusts the spiral stair tread depth in conformance with the method of measuring for winder tread depth at the intersections of the walk line with the nosing's instead of the prior*

Spiral stairway

method, which was square to the leading edge. The effective tread depth remains unchanged. The intent of the change in measuring methods, which occurred in the 2009 edition of the IRC, was to provide for consistent tread depth measurements conforming with stair design methodology, not to change or Increase tread depth. The long-accepted 7.-inch tread depth was based on the typical spiral layout with 13 treads per revolution or 27.692 degrees per tread. A 7½-inch measurement made square to the leading edge of the tread is equal to a 613/16-inch dimension when measured at the intersections of the walk line and nosing's. For the ease of applying the requirements, the required tread depth is rounded to 6¾ inches. This change intends to allow long-accepted manufacturing, material, and design standards to continue to meet the requirement and does not change the effective depth of the tread.

Justification: The model code provides changes that clarify requirements and provides additional design flexibility.

N/A



Alternating tread device

Section R202
Definitions

Alternating tread device. A device that has a series of steps between 50 and 70 degrees (0.87 and 1.22 rad) from horizontal, usually attached to a center support rail in an alternating manner so that the user does not have both feet on the same level at the same time.

R311.7.11 Alternating tread devices. Alternating tread devices shall not be used as an element of a means of egress. Alternating tread devices shall be permitted provided the required means of egress stairway or ramp serves the same space at each adjoining level or where a means of egress is not required. The clear width at and below the handrails shall be not less than 20 inches (508 mm).

R311.7.11.1 Treads of alternating tread devices. Alternating tread devices shall have a tread depth of not less than 5 inches (127 mm), a projected tread depth of not less than 8. inches (216 mm), a tread width of not less than 7 inches (178 mm), and a riser height of not more than 9. inches (241 mm). The tread depth shall be measured horizontally between the vertical planes of the foremost projections of adjacent treads. The riser height shall be measured vertically between the leading edges of adjacent treads. The riser height and tread depth provided shall result in an angle of ascent from the horizontal of between 50 and 70 degrees (0.87 and 1.22 rad). The initial tread of the device shall begin at the same elevation as the platform, landing, or floor surface.

R311.7.11.2 Handrails of alternating tread devices. Handrails shall be provided on both sides of alternating tread devices and shall comply with R311.7.8.2 thru R311.7.8.4. Handrail height shall be uniform, not less than 30 inches (762 mm) and not more than 34 inches (864 mm).

R311.7.12 Ship ladders. Ship ladders shall not be used as an element of a means of egress. Ship ladders shall be permitted provided a required means of egress stairway or ramp serves the same space at each adjoining level or where a means of egress is not required. The clear width at and below the handrails shall be not less than 20 inches.

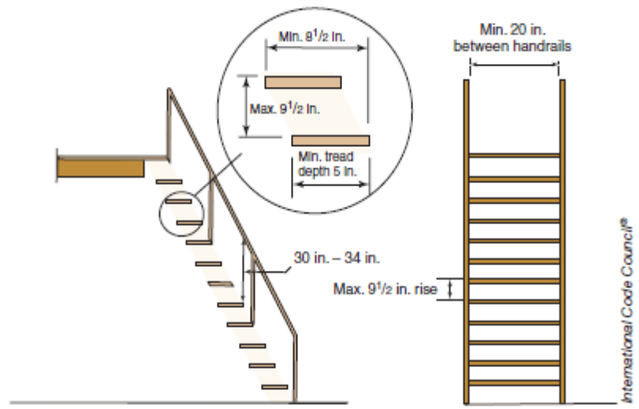
R311.7.12.1 Treads of ship ladders. Treads shall have a tread depth of not less than 5 inches (127 mm). The tread shall be projected such that the

City of Houston Amendment

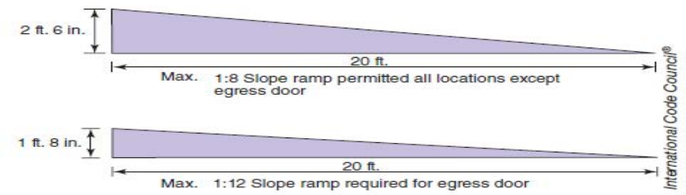
Analysis: Alternating tread devices and ship ladders have been added to the stair provisions. **NOTE:** Neither device is approved for use as a means of egress.

CHANGE SIGNIFICANCE: Alternating tread devices and ship ladders have been used in residential applications but have previously not appeared in the IRC. The new provisions adopt the dimensions and other specifications from the IBC to provide guidance when they are used. An alternating tread device or ship ladder cannot be used as an element of a means of egress, and can only be used when a means of egress is not required or when the required means of egress stairway or ramp is provided to serve the same space. Proponents held that these types of stairs will become more common and that introducing them into the code provides needed guidelines and allows for more design flexibility.

Justification: The model code includes additions that clarify requirements and provides additional design flexibility.



Ship ladder

	total of the tread depth plus the nosing projection is not less than 8. inches (216 mm). The riser height shall be not more than 9. inches (241 mm). **R311.7.12.2 Handrails of ship ladders.** Handrails shall be provided on both sides of ship ladders and shall comply with Sections R311.7.8.2 thru R311.7.8.4. Handrail height shall be uniform, not less than 30 inches (762 mm) and not more than 34 inches (864 mm).	
R311.8 Ramps. **R311.8.1 Maximum slope.** Ramps shall have a maximum slope of 1 unit vertical in 12 units horizontal (8.3-percent slope). **Exception:** Where it is technically infeasible to comply because of site constraints, ramps may have a maximum slope of one unit vertical in eight horizontal (12.5-percent slope).	**R311.8 Ramps.** **R311.8.1 Maximum slope.** Ramps serving the egress door required by Section R311.2 shall have a ~~maximum~~ slope of not more than 1 unit vertical in 12 units horizontal (8.3 percent slope). All other ramps shall have a maximum slope of 1 unit vertical to 8 units horizontal (12.5 percent slope). **Exception:** Where it is technically infeasible to comply because of site constraints, ramps shall have a ~~maximum~~ slope of not more than 1 unit vertical in 8 units horizontal (12.5 percent slope).  Maximum ramp slopes  © Darryl Brooks/Shutterstock.com Ramp serving the required egress door	***City of Houston Amendment*** **Analysis:** ***Modification –*** Ramps that do not serve a required egress door are now permitted to have a slope not greater than 1 unit vertical in 8 units horizontal. *CHANGE SIGNIFICANCE: Prior to the 2006 edition of the IRC, the code permitted ramps with a maximum slope of 1 unit vertical in 8 units horizontal (1:8 or 12.5 percent slope). The maximum slope was decreased to 1:12 in the 2006 IRC to provide accessibility for physically disabled persons and to promote designs that allow an aging population to stay in their homes longer, now often referred to as "aging in place." Such design features intend to increase safety, accessibility, and independence for older adults in their own homes. For the most part, IRC buildings are not required to be accessible, and ramps are not required. Ramps that are steeper than 1:12 are difficult or impossible to use for those in wheelchairs or using canes or walkers. The IRC has maintained an exception to allow a 1:8 slope ramp where it is not feasible to install a 1:12 slope ramp—for example, if the house is constructed on a sloped site or is located close to the property line. Consensus for the 2015 IRC is to allow the steeper 1:8 ramp in all situations, interior and exterior, unless the ramp serves the one required egress door. Proponents for the change to a less stringent rule reasoned that where ramps are constructed to serve the required egress door, requiring a 1:12 maximum slope is a reasonable accommodation for accessibility and the elderly. They also pointed to a similar provision in the IBC, which allows a 1:8 slope for pedestrian ramps not used as part of a means of egress. Shallower slope ramps take up more space, and the intent of the change is to provide more design flexibility for residential buildings constructed under the IRC. Construction of a ramp is an option in the IRC and is not mandatory. Likewise, building ramps with a lesser slope than the maximum allowed by the IRC also remains an option.* **Justification:** For the most part, IRC buildings are not required to be accessible, and ramps are not required. The intent of the change is to provide more design flexibility for residential buildings constructed under the IRC. Construction of a ramp is an option in the IRC and is not mandatory.
R312.1.2 Height. Required *guards* at open-sided walking surfaces, including stairs, porches, balconies, or landings, shall be not less than 36 inches (914 mm) high measured vertically above the adjacent walking surface, adjacent fixed seating or the line connecting the leading edges of the treads. **Exceptions:** **1.** *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. **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)	**R312.1.2 Height.** Required guards at open-sided walking surfaces, including stairs, porches, balconies, or landings, shall be not less than 36 inches (914 mm) ~~high~~ in height as measured vertically above the adjacent walking surface~~, adjacent fixed seating~~ or the line connecting the leading edges of the treads. **Exceptions:** **1.** 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. **2.** Where the top of the guard ~~also~~ serves as a handrail on the open sides of stairs, the top of the guard shall be not less than 34 inches (864 mm)	***City of Houston Amendment*** **Analysis:** The provision requiring that the guard height be measured from the surface of adjacent fixed seating has been removed from the code.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
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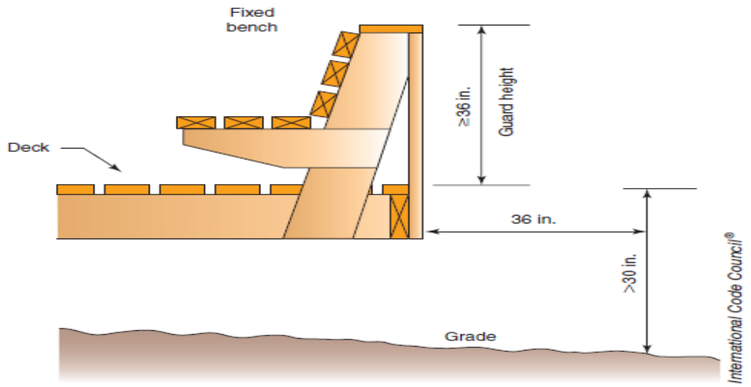
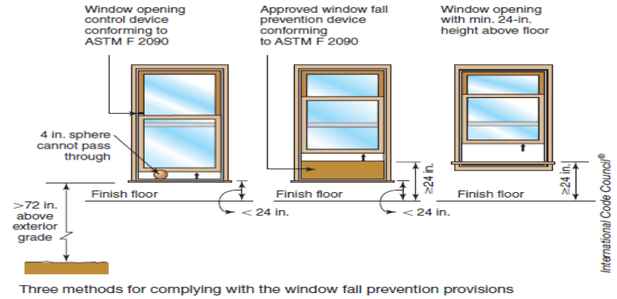
and not more than 38 inches (965 mm) measured vertically from a line connecting the leading edges of the treads.	and not more than 38 inches (965 mm) as measured vertically from a line connecting the leading edges of the treads.  Measuring guard height at fixed seating	 Example of a guard with fixed seating *CHANGE SIGNIFICANCE: The requirement to extend a guard 36 inches above the surface of fixed seating that is adjacent to a required guard, which appeared in the 2009 and 2012 IRC, has been removed from the code. A similar requirement appeared in the 2009 IBC but was deleted from the 2012 IBC. The provision was initially placed in the code due to the concern of children climbing on fixed seating and falling over the usual guard that had a height of 36 inches above the walking surface of the deck. With the removal of the provision, the IRC and IBC are now consistent with each other in this area. Proponents of this change reasoned that there was no technical justification to raise the height of the guard at the back of fixed seating when it was placed in the code and that the requirement was overly restrictive. There also were concerns that there has been no definition of fixed seating. Consensus held that fixed seating, like movable furniture and other objects found adjacent to guards on a deck, should not be regulated as a walking surface.* **Justification:** In lieu of paying to strike the language of this section, the committee chose to make an editorial note as it would be less expensive.
R312.2 Window fall protection. Window fall protection shall be provided in accordance with Sections R312.2.1 and R312.2.2. **R312.2.1 Windowsills.** In dwelling units, where the opening of an operable window is located more than 72 inches (1,829 mm) above the finished grade or surface below, the lowest part of the clear opening of the window shall be a minimum of 24 inches (610 mm) above the finished floor of the room in which the window is located. Operable sections of windows shall not permit openings that allow passage of a 4-inch-diameter (102 mm) sphere where such openings are located within 24 inches (610 mm) of the finished floor. **Exceptions:** 1. Windows whose openings will not allow a 4-inch-diameter (102 mm) sphere to pass through the opening when the opening is in its largest opened position. 2. Openings that are provided with window fall prevention devices that comply with ASTM F 2090. 3. Windows that are provided with window opening control devices that comply with Section R312.2.2. **R312.2.2 Window opening control devices.** Window opening 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 R310.1.1.	**R312.2 Window fall protection.** Window fall protection shall be provided in accordance with Sections R312.2.1 and R312.2.2. **R312.2.1 Windowsills.** In dwelling units, where the top of the sill opening of an operable window opening is located less than 24 inches (610 mm) above the finished floor and greater ~~more~~ than 72 inches (1,829 mm) above the finished grade or other surface below on the exterior of the building, the operable window shall comply with one of the following: ~~the lowest part of the clear opening of the window shall be a minimum of 24 inches (610 mm) above the finished floor of the room in which the window is located. Operable sections of windows shall not permit openings that allow passage of a 4-inch-diameter (102 mm) sphere where such openings are located within 24 inches (610 mm) of the finished floor.~~ **Exceptions:** 1. Operable windows ~~whose~~ with openings that will not allow a 4-inch-diameter (102 mm) sphere to pass through the opening ~~when~~ where the opening is in its largest opened position. 2. ~~Openings~~ Operable windows that are provided with window fall prevention devices that comply with ASTM F 2090. 3. Operable windows that are provided with window opening control devices that comply with Section R312.2.2. **R312.2.2 Window opening control devices.** Window opening 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 R310.2.1.	***City of Houston Amendment*** **Analysis:** ***Clarification –*** The window fall prevention provisions have been revised to clarify the meaning, remove redundant language, and achieve consistency with the IBC provisions.  Three methods for complying with the window fall prevention provisions *CHANGE SIGNIFICANCE: The provisions for fall protection intend to reduce the number of injuries to children resulting from falls through windows. This section has been reorganized to clarify the application. Previously, the code required that the lowest portion of an operable window opening had to be at least 24 inches above the floor when located more than 72 inches above the finished grade or other surface below. The code then listed three exceptions, the first of which repeated language from the main section regarding the 4-inch-sphere rule for the window opening. The rules are the same, but the code now takes another approach in explaining the requirements. The language in the main section is changed to say that when the window opening does not meet the 24-inch rule for sill height, then one of the three options must be chosen for compliance with the code. These options are now listed as conditions rather than exceptions.* **Justification:** In lieu of paying to strike the language of this section, the committee chose to make an editorial note as it would be less expensive.

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SECTION R313 **AUTOMATIC FIRE SPRINKLER SYSTEMS** **R313.1 Townhouse automatic fire sprinkler systems.** An automatic residential fire sprinkler system shall be installed in *townhouses*. **Exception:** An automatic residential fire sprinkler system shall not be required when *additions* or *alterations* are made to existing *townhouses* that do not have an automatic residential fire sprinkler system installed. **R313.1.1 Design and installation.** Automatic residential fire sprinkler systems for *townhouses* shall be designed and installed in accordance with Section P2904. ~~**R313.2 One- and two-family dwellings automatic fire systems.** An automatic residential fire sprinkler system shall be installed in one- and two-family *dwellings*.~~ ~~**Exception**: An automatic residential fire sprinkler system shall not be required for *additions* or *alterations* to existing buildings that are not already provided with an automatic residential sprinkler system.~~ ~~**R313.2.1 Design and installation.** Automatic residential fire sprinkler systems shall be designed and installed in accordance with Section P2904 or NFPA 13D.~~	**SECTION R313** **AUTOMATIC FIRE SPRINKLER SYSTEMS** **R313.1 Townhouse automatic fire sprinkler systems.** An automatic residential fire sprinkler system shall be installed in *townhouses*. **Exception:** An automatic residential fire sprinkler system shall not be required where *additions* or *alterations* are made to existing *townhouses* that do not have an automatic residential fire sprinkler system installed. **R313.1.1 Design and installation.** Automatic residential fire sprinkler systems for *townhouses* shall be designed and installed in accordance with Section P2904 or NFPA 13D. ~~**R313.2 One- and two-family dwellings automatic fire systems.** An automatic residential fire sprinkler system shall be installed in one- and two-family dwellings.~~ ~~**Exception:** An automatic residential fire sprinkler system shall not be required for additions or alterations to existing buildings that are not already provided with an automatic residential sprinkler system.~~ ~~**R313.2.1 Design and installation.** Automatic residential fire sprinkler systems shall be designed and installed in accordance with Section P2904 or NFPA 13D.~~	***City of Houston Amendment*** **Analysis:** The previous IRC 2012 COH amendment in Section R313.2 is retained due to specific restrictions of Texas Occupations Code Sec. 1301.551(i) prohibiting a municipality from requiring fire sprinkler protection to be installed in any new or existing one- or two-family dwelling. **NOTE:** As townhouses are not a one- or two-family dwelling, residential type NFPA 13D or fire sprinklers installed to the code provisions of Section P2904 of this code, continues to be required for all townhouse constructed using the code provisions of the IRC. **Justification:** In lieu of paying to strike the language of this section, the committee chose to make an editorial note as it would be less expensive.
~~**R313.2.1 Design and installation.** Automatic residential fire sprinkler systems shall be designed and installed in accordance with Section P2904 or NFPA 13D.~~	~~**R313.2.1 Design and installation.** Automatic residential fire sprinkler systems shall be designed and installed in accordance with Section P2904 or NFPA 13D.~~	***City of Houston Amendment*** **Analysis:** The COH amendment was omitted. **Justification:** This change was needed to ensure conformity with state and local government policy.
SECTION R314 **SMOKE ALARMS** **R314.1 Smoke detection and notification.** All smoke alarms shall be listed and labeled in accordance with UL 217 and installed in accordance with the provisions of this code and the household fire warning *equipment* provisions of NFPA 72. **R314.2 Smoke detection systems.** Household fire alarm systems installed in accordance with NFPA 72 that include smoke alarms, or a combination of smoke detector and audible notification device installed as required by this section for smoke alarms, shall be permitted. The household fire alarm system shall provide the same level of smoke detection and alarm as required by this section for smoke alarms. Where a household fire warning system is installed using a combination of smoke detector and audible notification device(s), it shall become a permanent fixture of the occupancy and owned by the homeowner. The system shall be monitored by an *approved* supervising station and be maintained in accordance with NFPA 72. **Exception:** Where smoke alarms are provided meeting the requirements of Section R314.4. **R314.3 Location.** Smoke alarms shall be installed in the following locations: **1.** In each sleeping room. **2.** Outside each separate sleeping area in the immediate vicinity of the bedrooms.	**SECTION R314** **SMOKE ALARMS** **R314.1 General.** Smoke alarms shall comply with NFPA 72 and Section R314. **R314.1.1 Listings.** Smoke alarms shall be listed in accordance with UL 217. Combination smoke and carbon monoxide alarms shall be listed in accordance with UL 217 and UL 2034. **R314.2 Where required.** Smoke alarms shall be provided in accordance with this section. **R314.2.1 New construction.** Smoke alarms shall be provided in dwelling units. ~~**R314.3.1**~~ **R314.2.2 Alterations, repairs, and additions.** Where alterations, repairs, or additions requiring a permit occur, or when one or more sleeping rooms are added or created in existing dwellings, the individual dwelling unit shall be equipped with smoke alarms located as required for new dwellings. **Exceptions:** **1.** Work involving the exterior surfaces of dwellings, such as the replacement of roofing or siding, or the addition or replacement of windows or doors, or the addition of a porch or deck, are exempt from the requirements of this section. **2.** Installation, alteration, or repairs of plumbing or mechanical systems are exempt from the requirements of this section.	***City of Houston Amendment*** **Analysis:** Battery-operated smoke alarms are permitted for satisfying the smoke alarm power requirements when alterations, repairs, and additions occur. Household fire alarm systems no longer require monitoring by an approved supervising station. New provisions address smoke alarms installed near bathrooms and cooking appliances. *CHANGE SIGNIFICANCE: The smoke alarm provisions in Section R314 have been reorganized in a user-friendly sequential order to clarify their application. The household fire alarm system provisions have been placed in a separate Section R314.7 following all the smoke alarm provisions in Sections R314.1 through R314.6. In addition, new charging sections have been added to clarify the scope and make the provisions easier to locate.* *New provisions allow the installation of combination smoke and carbon monoxide alarms complying with the applicable standards. Combination alarms are commonly installed outside of bedroom areas in residential construction as an acceptable method for satisfying both smoke alarm and carbon monoxide alarm provisions in the IRC, and this change simply recognizes a method that is already in practice.* *The changes to the smoke alarm provisions in Section R314 are largely editorial and in most cases do not intend to create any technical changes. However, there is a minor change in the language regarding power requirements for smoke alarms installed in existing buildings. Smoke alarms are one of the few requirements that are retroactive in the IRC. Interior remodeling work and room additions that require permits do trigger the installation of smoke alarms in the same locations as are required for new dwellings. Previous editions of the code have generally required these smoke alarms to also meet the power and interconnection requirements. An exception has recognized that it is not always feasible to install the additional wiring necessary to bring electricity to the devices or to connect the devices so that when one alarm sounds all alarms in the dwelling activate. Therefore, hard wiring of smoke alarms in existing areas was not required if the alterations or repairs did not result in the removal of interior wall or ceiling finishes exposing the structure. The code further stated that if there existed an attic, crawl space, or basement*

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3. On each additional *story* of the *dwelling*, including *basements* and habitable attics but not including crawl spaces and uninhabitable *attics*. In *dwellings* or *dwelling units* with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full *story* below the upper level.

R314.3.1 Alterations, repairs, and additions. When *alterations*, repairs or *additions* requiring a *permit* occur, or when one or more sleeping rooms are added or created in existing *dwellings*, the individual *dwelling unit* shall be equipped with smoke alarms located as required for new *dwellings*.

Exceptions:

1. Work involving the exterior surfaces of *dwellings*, such as the replacement of roofing or siding, or the *addition* or replacement of windows or doors, or the *addition* of a porch or deck, are exempt from the requirements of this section.
2. Installation, *alteration,* or repairs of plumbing or mechanical systems are exempt from the requirements of this section.

R314.4 Power source. Smoke alarms shall receive their primary power from the building wiring when such wiring is served from a commercial source, and when primary power is interrupted, shall receive power from a battery. Wiring shall be permanent and without a disconnecting switch other than those required for overcurrent protection.

Exceptions:

1. Smoke alarms shall be permitted to be battery operated when installed in buildings without commercial power.
2. Hard wiring of smoke alarms in existing areas shall not be required where the *alterations* or repairs do not result in the removal of interior wall or ceiling finishes exposing the structure, unless there is an *attic*, crawl space or *basement* available which could provide access for hard wiring without the removal of interior finishes.

R314.5 Interconnection. Where more than one smoke alarm is required to be installed within an individual dwelling unit in accordance with Section R314.3, the alarm devices shall be interconnected in such a manner that the actuation 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 upon activation of one alarm.

Exception: Interconnection of smoke alarms in existing areas shall not be required where alterations or repairs do not result in removal of interior wall or ceiling finishes exposing the structure, unless there is an attic, crawl space or basement available which could provide access for interconnection without the removal of interior finishes.

R314.3 Location. Smoke alarms shall be installed in the following locations:

1. In each sleeping room.
2. Outside each separate sleeping area in the immediate vicinity of the bedrooms.
3. On each additional story of the dwelling, including basements and habitable attics ~~but~~ and not including crawl spaces and uninhabitable attics. In dwellings or dwelling units with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full story below the upper level.
4. Smoke alarms shall be installed not less than 3 feet (914 mm) horizontally from the door or opening of a bathroom that contains a bathtub or shower unless this would prevent placement of a smoke alarm required by Section R314.3.

R314.3.1 Installation near cooking appliances. Smoke alarms shall not be installed in the following locations unless this would prevent placement of a smoke alarm in a location required by Section R314.3.

1. Ionization smoke alarms shall not be installed less than 20 feet (6096 mm) horizontally from a permanently installed cooking appliance.
2. Ionization smoke alarms with an alarm-silencing switch shall not be installed less than 10 feet (3048 mm) horizontally from a permanently installed cooking appliance.
3. Photoelectric smoke alarms shall not be installed less than 6 feet (1828 mm) horizontally from a permanently installed cooking appliance.

~~R314.5~~ **R314.4 Interconnection.** Where more than one smoke alarm is required to be installed within an individual dwelling unit in accordance with Section R314.3, the alarm devices shall be interconnected in such a manner that the actuation of one alarm will activate all of the alarms in the individual dwelling unit. Physical interconnection of smoke alarms shall not be required where listed wireless alarms are installed and all alarms sound upon activation of one alarm.

Exception: Interconnection of smoke alarms in existing areas shall not be required where alterations or repairs do not result in removal of interior wall or ceiling finishes exposing the structure, unless there is an attic, crawl space, or basement available which could provide access for interconnection without the removal of interior finishes.

R314.5 Combination alarms. Combination smoke and carbon monoxide alarms shall be permitted to be used in lieu of smoke alarms.

~~R314.4~~ **R314.6 Power source.** Smoke alarms shall receive their primary power from the building wiring where such wiring is served from a commercial source, and where primary power is interrupted, shall receive power from a battery. Wiring shall be permanent and without a disconnecting switch other than those required for overcurrent protection.

Exceptions:

1. Smoke alarms shall be permitted to be battery operated when installed in buildings without commercial power.
2. Smoke alarms installed in accordance with Section R314.2.2 shall be permitted to be battery powered. ~~Hard wiring of smoke alarms in existing areas shall not be required where the alterations or repairs do not result~~

that could provide access for hard wiring without the removal of interior finishes, then connection to the dwelling unit electrical system was required. Otherwise, the code permitted the installation of battery-operated smoke alarms in these existing areas.

This has always been a judgment call on the part of the building official, and many jurisdictions have developed procedures or guidelines for determining if it is feasible to bring power to new smoke alarms in existing buildings. Although installing a battery-operated smoke alarm is relatively easy and inexpensive, installing electrical wiring in an existing building can be very costly. The new language in the 2015 IRC does not address the feasibility of connecting to the electrical system in existing buildings. Exception 2 of Section R314.6 says that smoke alarms installed in accordance with Section R314.2.2 for alterations, repairs, and additions are permitted to be battery powered. The change to more prescriptive language will simplify the administration of the code and encourage consistency in the application during remodeling of existing buildings without imposing excessive costs, while at the same time providing an acceptable level of safety with the installation of battery-operated smoke alarms in all the locations required for new buildings.

The provisions for interconnecting smoke alarms in existing areas have not changed from the 2012 edition. The exception in Section R314.4 requires interconnection of smoke alarms in existing areas where interior wall or ceiling finishes are removed or where there is an attic, crawl space, or basement available that could provide access for interconnection without the removal of interior finishes. As an alternative, the code specifically allows wireless interconnection of smoke alarms in lieu of physical interconnection.

Another new approach in the 2015 IRC intends to reduce nuisance alarms by requiring minimum separation distances between smoke alarms and cooking appliances, and between smoke alarms and bathrooms. The new requirements are like those in NFPA 72, National Fire Alarm Code, which is a referenced standard in the smoke alarm provisions of Section R314. The code now requires a minimum separation of 3 feet from bathrooms because steam and water vapor produced by bathtubs and showers can trigger operation of the smoke alarm. The minimum separation requirements from permanently installed cooking appliances vary based on the type of smoke alarm installed. Ionization smoke alarms generally require a separation distance of 20 feet, but that distance may be reduced to 10 feet if the smoke alarm has an alarm-silencing switch. Photoelectric smoke alarms are less susceptible to activation by smoke and cooking vapors and are permitted to be located as close as 6 feet from a permanently installed cooking appliance. The intent is to regulate separation distance from built-in cook tops and ovens as well as stand-alone kitchen ranges. The word "permanent" intends to exclude movable countertop cooking appliances from the separation requirements.

For installation in proximity to both bathrooms and cooking appliances, exceptions permit installation less than the prescribed separation distances if such installation is required by the location requirements of Section R314.3. For example, in a small house the kitchen, bathroom, and bedroom may be grouped closely together. The code would require installation of a smoke alarm in the hallway outside the bedroom even though the location does not meet the separation requirements from the bathroom or cooking appliance. The primary concern is safety by providing early warning of a fire for the occupants, particularly if they are sleeping, and nuisance alarms are of secondary importance. In most cases builders follow the manufacturer's installation instructions and industry-accepted practices to provide adequate separation from cooking appliances and bathrooms, and to avoid costly callbacks from unhappy customers.

As an alternative to the individual smoke alarm requirements, the code permits the installation of a household fire alarm system installed in accordance with NFPA 72. These fire alarm systems rely on separate detection devices installed in the same required locations as smoke alarms and separate annunciating devices installed in various locations of the home in accordance with the design. These systems become a permanent fixture of the occupancy and are owned by the homeowner as prescribed in the code. This provision intends to avoid systems that are leased to the homeowner by an alarm company and could subsequently be removed by the alarm company if the homeowner discontinued service, leaving the home with no smoke detection and notification protection. The permanent fixture and ownership provisions remain in the 2015 IRC. However, there has been confusion regarding the requirement for systems to be monitored by an approved supervising station, and this requirement was considered difficult to enforce. Proponents reasoned that a system that provides local alarm notification satisfies the intent of the code to provide early warning to occupants and that it was difficult to justify the extra costs associated with monitoring by a supervising station. The code does not prohibit monitoring, but it is now an option rather than a requirement. In addition, the reference in Section R314.2 of the 2012 IRC to systems being maintained in accordance with NFPA 72 has been removed because it was considered outside the scope and intent of the IRC.

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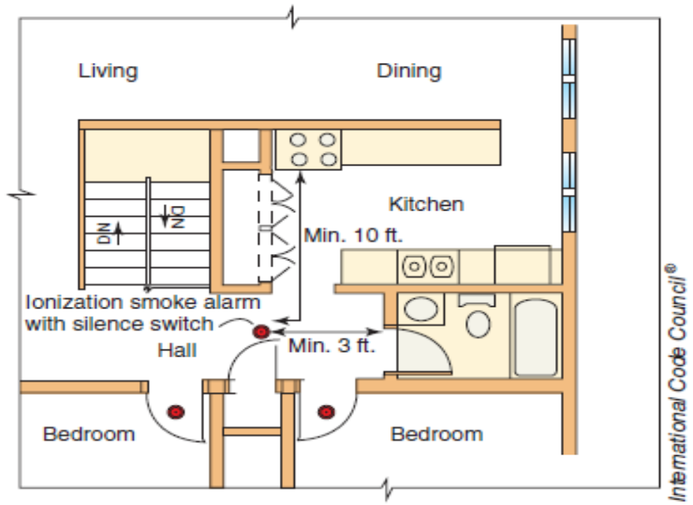

Smoke alarm distances from bathrooms and cooking appliances

~~in the removal of interior wall or ceiling finishes exposing the structure, unless there is an attic, crawl space or basement available which could provide access for hard wiring without the removal of interior finishes.~~

R314.7 Fire alarm systems. Fire alarm systems shall be permitted to be used in lieu of smoke alarms and shall comply with Sections R314.7.1 through R314.7.4.

~~**R314.2 Smoke detection systems.**~~ **R314.7.1 General.** Fire alarm systems shall comply with the provisions of this code and the household fire warning equipment provisions of NFPA 72. Smoke detectors shall be listed in accordance with UL 268. ~~Household fire alarm systems installed in accordance with NFPA 72 that include smoke alarms, or a combination of smoke detector and audible notification device installed as required by this section for smoke alarms, shall be permitted. The household fire alarm system shall provide the same level of smoke detection and alarm as required by this section for smoke alarms.~~

R314.7.2 Location. Smoke detectors shall be installed in the locations specified in Section R314.3.

~~**R314.2 Smoke detection systems.**~~ **R314.7.3 Permanent fixture.** Where a household fire alarm system is installed ~~using a combination of smoke detector and audible notification device(s),~~ it shall become a permanent fixture of the occupancy ~~and~~, owned by the homeowner. ~~The system shall be monitored by an approved supervising station and be maintained in accordance with NFPA 72.~~

R314.7.4 Combination detectors. Combination smoke/carbon monoxide detectors shall be permitted to be installed in fire alarm systems in lieu of smoke detectors, provided they are listed in accordance with UL 268 and UL 2075.

Justification: This change was needed to ensure conformity with state and local government policy.

SECTION R315
CARBON MONOXIDE ALARMS

R315.1 Carbon monoxide alarms. For new construction, an approved carbon monoxide alarm shall be installed outside of each separate sleeping area in the immediate vicinity of the bedrooms in *dwelling units* within which fuel-fired *appliances* are installed and in dwelling units that have attached garages.

R315.2 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. Where a household carbon monoxide detection system is installed, it shall become a permanent fixture of the occupancy, owned by the homeowner, and shall be monitored by an approved supervising station.

Exception: Where carbon monoxide alarms are installed meeting the requirements of Section R315.1, compliance with Section 315.2 is not required.

R315.3 Where required in existing dwellings. Where work requiring a *permit* occurs in existing *dwellings* that have attached garages or in existing dwellings within which fuel-fired *appliances* exist, carbon monoxide alarms shall be provided in accordance with Section R315.1.

SECTION R315
CARBON MONOXIDE ALARMS

R315.1 General. Carbon monoxide alarms shall comply with Section R315.

R315.1.1 Listings. Carbon monoxide alarms shall be listed in accordance with UL 2034. Combination carbon monoxide/smoke alarms shall be listed in accordance with UL 2034 and UL 217.

R315.2 Where required. Carbon monoxide alarms shall be provided in accordance with Sections R315.2.1 and R315.2.2.

~~**R315.1 Carbon monoxide alarms.**~~ **R315.2.1 New construction.** For new construction, ~~an approved~~ carbon monoxide alarms shall be ~~installed outside of each separate sleeping area in the immediate vicinity of the bedrooms in dwelling units within which fuel-fired appliances are installed and in dwelling units that have attached garages.~~ provided in dwelling units where either or both of the following conditions exist.

1. The dwelling unit contains a fuel-fired appliance.
2. The dwelling unit has an attached garage with an opening that communicates with the dwelling unit.

~~**R315.3 Where required in existing dwellings.**~~ **R315.2.2 Alterations, repairs, and additions.** Where ~~work~~ alterations, repairs, or additions requiring a permit occurs ~~in existing dwellings that have attached garages or in existing~~

City of Houston Amendment

Analysis: Carbon monoxide alarms now require connection to the house wiring system with battery backup. Exterior work such as roofing, siding, windows, doors, and deck and porch additions no longer trigger the carbon monoxide alarm provisions for existing buildings. An attached garage is one criterion for requiring carbon monoxide alarms, but only if the garage has an opening into the dwelling. A carbon monoxide alarm is required in bedrooms when there is a fuel-fired appliance in the bedroom or adjoining bathroom. Carbon monoxide detection systems only require detectors installed in the locations prescribed by the code and not those locations described in NFPA 720.

CHANGE SIGNIFICANCE: The carbon monoxide alarm provisions in Section R315 have been reorganized to clarify their application. For example, the carbon monoxide detection system provisions have been placed in a separate Section R315.6 following all the carbon monoxide alarm provisions in Sections R315.1 through R315.5. In addition, new charging sections have been added to clarify the scope and make the provisions easier to locate. Several technical changes have also occurred. The carbon monoxide alarm provisions have been rewritten to generally align with the smoke alarm provisions. For example, connection to the house wiring system with battery backup is now required for carbon monoxide alarms installed in new dwellings. Previously, the code only referenced compliance with UL 2075, which permits battery-operated, plug-in, or hard-wired alarms. Battery-operated carbon monoxide alarms are still permitted for satisfying the requirements in existing buildings, matching the revised provisions for smoke alarms. When work requiring a permit occurs, alarms must be installed in the locations prescribed by the code, but hard wiring is not required. New to the 2015 IRC, exterior work requiring a permit, such as roofing, siding, windows, doors, porches, and decks, does not trigger the retroactive carbon monoxide

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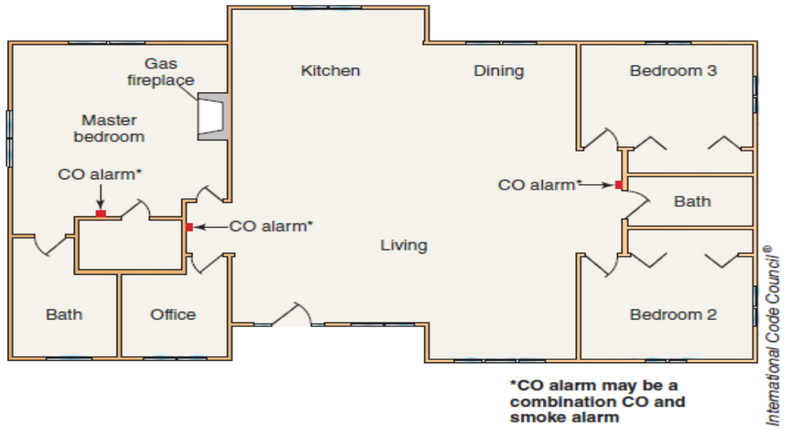
R315.4 Alarm requirements. Single-station carbon monoxide alarms shall be listed as complying with UL 2034 and shall be installed in accordance with this code and the manufacturer's installation instructions.



Carbon monoxide alarms required outside each separate sleeping area and in bedrooms containing fuel-fired appliances

Exterior work, such as a deck addition or re-siding, does not trigger the carbon monoxide provisions.

~~dwellings within which fuel-fired appliances exist~~, or where one or more sleeping rooms are added or created in existing dwellings, ~~carbon monoxide alarms shall be provided in accordance with Section R315.1.~~ the individual dwelling unit shall be equipped with carbon monoxide alarms located as required for new dwellings.

Exceptions:

1. Work involving the exterior surfaces of dwellings, such as the replacement of roofing or siding, or the addition or replacement of windows or doors, or the addition of a porch or deck, are exempt from the requirements of this section.
2. Installation, alteration, or repairs of plumbing or mechanical systems are exempt from the requirements of this section.

R315.3 Location. Carbon monoxide alarms in dwelling units shall be installed outside of each separate sleeping area in the immediate vicinity of the bedrooms. Where a fuel-burning appliance is located within a bedroom or its attached bathroom, a carbon monoxide alarm shall be installed within the bedroom.

R315.4 Combination alarms. Combination carbon monoxide and smoke alarms shall be permitted to be used in lieu of carbon monoxide alarms.

R315.5 Power source. Carbon monoxide alarms shall receive their primary power from the building wiring where such wiring is served from a commercial source, and where primary power is interrupted, shall receive power from a battery. Wiring shall be permanent and without a disconnecting switch other than those required for overcurrent protection.

Exceptions:

1. Carbon monoxide alarms shall be permitted to be battery operated where installed in buildings without commercial power.
2. Carbon monoxide alarms installed in accordance with Section R315.2.2 shall be permitted to be battery powered.

R315.6 Carbon monoxide detection systems. Carbon monoxide detection systems shall be permitted to be used in lieu of carbon monoxide alarms and shall comply with Sections R315.6.1 to R315.6.4.

R315.6.1 General. Household carbon monoxide detection systems shall comply with NFPA 720. Carbon monoxide detectors shall be listed in accordance with UL 2075.

R315.6.2 Location. Carbon monoxide detectors shall be installed in the locations specified in Section R315.3. These locations supersede the locations specified in NFPA 720.

R315.6.3 Permanent fixture. Where a household carbon monoxide detection system is installed, it shall become a permanent fixture of the occupancy and owned by the homeowner. and shall be monitored by an approved supervising station.

R315.6.4 Combination detectors. Combination carbon monoxide/smoke detectors shall be permitted to be installed in carbon monoxide detection systems in lieu of carbon monoxide detectors, provided they are listed in accordance with UL 2075 and UL 268.

alarm requirements. This language mirrors the exemption in the smoke alarm provisions. Unlike the smoke alarm provisions, when two or more carbon monoxide alarms are required, interconnection of the alarms is not required.

The carbon monoxide alarm provisions are only in effect when the dwelling contains fuel-fired appliances or has an attached garage. A malfunctioning fuel-fired appliance, such as a gas-fired furnace, water heater, or fireplace, is the most common cause of carbon monoxide poisoning in homes. Automobile exhaust migrating into the home from an attached garage is the other hazard addressed by the code requirements. Because the hazard of carbon monoxide gas from a garage depends on an opening between the garage and the dwelling unit, typically a door in the common wall, the code now only addresses garages with openings into the dwelling. Attached garages that do not communicate with the house do not trigger the carbon monoxide alarm requirements.

The code requires carbon monoxide alarms to be installed outside of each separate sleeping area in the immediate vicinity of the bedrooms to protect people when they are most vulnerable to the effects of carbon monoxide poisoning—when they are sleeping or not fully alert. The 2015 IRC requires an additional alarm to be in the bedroom when a fuel-fired appliance is installed in the bedroom or the adjoining bathroom. The IRC allows fuel-burning appliances to be installed in bedrooms and bathrooms, but this is not a common practice. When one is installed, the new requirement intends to provide early warning to protect occupants who sleep with their bedroom door closed from a potential source of carbon monoxide poisoning within the space.

New provisions specifically permit the installation of combination carbon monoxide and smoke alarms complying with the applicable standards. Combination alarms are commonly installed outside of bedroom areas in residential construction as an acceptable method for satisfying both the smoke alarm and the carbon monoxide alarm provisions in the IRC, and this change simply recognizes a method that is already in practice.

As an alternative to the individual carbon monoxide alarm requirements, the code permits the installation of a carbon monoxide detection system installed in accordance with NFPA 720. These systems have separate detection devices installed in the same required locations as carbon monoxide alarms. Carbon monoxide detection systems become a permanent fixture of the dwelling unit and are owned by the homeowner as prescribed in the code. This provision intends to avoid systems that are leased to the homeowner by an alarm company and could subsequently be removed by the alarm company if the homeowner discontinued service, leaving the home with no protection for detecting rising levels of carbon monoxide gas. The permanent fixture and ownership provisions remain in the 2015 IRC. However, there has been confusion regarding the requirement for systems to be monitored by an approved supervising station, and this requirement was considered difficult to enforce. Proponents reasoned that a system that provides local alarm notification satisfies the intent of the code to provide early warning to occupants of increased levels of carbon monoxide gas and that it was difficult to justify the extra costs associated with monitoring by a supervising station. The code does not prohibit monitoring, but it is now an option rather than a requirement. Language has also been added to the detection system requirements to clarify that the detectors only need to be installed in locations specified in Section R315.3, outside of each separate sleeping area in the immediate vicinity of the bedrooms, not in all the locations specified in NFPA 720.

Justification: This change was needed to ensure conformity with state and local government policy.

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{EDITOR'S NOTE: DELETE SECTION R318 IN ITS ENTIRETY.} **[RB] TERMITE-RESISTANT MATERIAL.** Pressure-preservative treated wood in accordance with the A WPA standards in Section R318.1, naturally durable termite-resistant wood, steel, concrete, masonry, or other *approved* material. **R318.1 Subterranean termite control methods.** In areas subject to damage from termites as indicated by Table R301.2(1), methods of protection shall be one, or a combination, of the following methods: 1. Chemical termiticide treatment in accordance with Section R318.2. 2. Termite baiting system installed and maintained in accordance with the *label.* 3. Pressure-preservative-treated wood in accordance with the provisions of Section R317.1. 4. Naturally durable termite-resistant wood. 5. Physical barriers in accordance with Section R318.3 and used in locations as specified in Section R317.1. 6. Cold-formed steel framing in accordance with Sections R505.2.1 and R603.2.1.	**SECTION R318** **PROTECTION AGAINST** **SUBTERRANEAN TERMITES** **[RB] TERMITE-RESISTANT MATERIAL.** Pressure-preservative treated wood in accordance with the AWPA standards in Section R318.1, naturally durable termite-resistant wood, steel, concrete, masonry, or other *approved* material. * Section R318.1 allows for termite-resistant materials as protection against termites. Typical materials include steel, concrete and masonry. **R318.1 Subterranean termite control methods.** In areas subject to damage from termites as indicated by Table R301.2(1), methods of protection shall be one, or a combination, of the following methods: 1. Chemical termiticide treatment in accordance with Section R318.2. 2. Termite baiting system installed and maintained in accordance with the *label.* 3. Pressure-preservative-treated wood in accordance with the provisions of Section R317.1. 4. Naturally durable termite-resistant wood. 5. Physical barriers in accordance with Section R318.3 and used in locations as specified in Section R317.1. 6. Cold-formed steel framing in accordance with Sections R505.2.1 and R603.2.1.	***City of Houston Amendment*** **Analysis:** The previous IRC amendment deleting this section from the Houston code was omitted, and the model code provisions retained in the Houston adopted code to provide protection against the heavy subterranean termite infestation in the Houston area. *CHANGE SIGNIFICANCE: This section establishes the rules for the protection of structures from damage caused by termites. The methods of protection address not only wood members, but also foam plastic and cold-formed steel materials. Figure R301.2(6) illustrates those geographical areas where termite damage is probable. In those areas, the structure must be protected from termite damage in an appropriate manner. There are several methods permitted by the code to provide the necessary protection against termite damage. The most common method of termite control is soil poisoning. Alternatives include the use of pressure-preservative treated, naturally termite-resistant wood and barriers over perimeter walls. Often a combination of these methods is necessary to establish the required level of protection. The six acceptable methods of protection are broken out to make them easier to read.* **Justification:** The city recommended omitting the previous COH amendment to remove the provisions of Section R318, as termite protection is very necessary for the Houston area. No justification for deleting this requirement where infestation is extremely likely.
R319.1 Address numbers. Building numbering shall be provided in accordance with Chapter 10, Article V, of the *City Code.* Buildings shall have *approved* address numbers, building numbers or *approved* building identification placed in a position that is plainly legible and visible from the street or road fronting the property. These numbers shall contrast with their background. Address numbers shall be Arabic numbers or alphabetical letters. Numbers shall be a minimum of 4 inches (102 mm) high with a minimum stroke width of ½ inch (12.7 mm). Where access is by means of a private road and the building address cannot be viewed from the public way, a monument, pole, or other sign or means shall be used to identify the structure.	**R319.1 Address identification.** A numerical address identification posted with respect to any building constructed pursuant to this code shall be provided in accordance with Chapter 10, Article V, of the *City Code.* Where a conflict exists between the *City Code* and this section, the provisions of the *City Code* shall prevail. ~~Buildings shall be provided with *approved* address identification.~~ The address identification shall be legible and placed in a position that is visible from the street or road fronting the property. Address identification ~~characters~~ *shall* be comprised of Arabic numbers or alphabetical letters and contrast with their background. ~~Address numbers *shall* be Arabic numbers or alphabetical letters. Numbers *shall* not be spelled out.~~ Each ~~character~~ number or letter *shall* be not less than 4 inches (102 mm) in height with a stroke width of not less than 0.5 inch (12.7 mm). Where required by the fire code official, address identification *shall* be provided in additional *approved* locations to facilitate emergency response. Where access is by means of a private road and the *building* address cannot be viewed from the *public right-of-way*, a monument, pole, or other signs or means *shall* be used to identify the *structure*. Address identification *shall* be maintained in good and readable condition from the public right-of-way.	***City of Houston Amendment*** **Analysis:** The previous COH amendment was modified to provide additional details based on certain *City Code* requirements. ***No change to the previous technical code requirements or code intent of this section.*** **Justification:** This amendment and the new changes is needed to ensure clarity and conformity with state and local government policy.
~~**R321.3 Accessibility.** Elevators or platform lifts that are part of an accessible route required by Chapter 11 of the *International Building Code*, shall comply with ICC A117.1.~~	~~**R321.3 Accessibility.** Elevators or platform lifts that are part of an accessible route required by Chapter 11 of the *International Building Code*, shall comply with ICC A117.1.~~	***City of Houston Amendment*** **Analysis:** The COH amendment was carried forward in the IRC 2015. Permit application must document the State issued TAS project number where the commercial project cost of construction is equal to or greater than $50,000 ***No change to the previous technical code requirements or code intent of this section.*** **Justification:** For code application and clarity the text of this section is deleted. The City of Houston relies on 3rd party state certified accessibility plan review

		and field inspections for compliance with TAS. This review process is a separate process completed through the state.
R322.1 General. Buildings and structures constructed in whole or in part in flood hazard areas (including A or V Zones) as established in Table R301.2(1) shall be designed and constructed in accordance with the provisions contained in Chapter 19 of the *City Code*. ~~this section. Buildings and structures located in whole or in part in identified floodways shall be designed and constructed in accordance with ASCE 24~~. {**EDITOR'S NOTE:** **DELETE** REMAINDER OF **SECTION R322.**}  Residential construction in a coastal A zone	**R322.1 General.** Buildings and structures constructed in whole or in part in flood hazard areas, including A or V Zones and Coastal A Zones, as established in Table R301.2(1), and substantial improvement and restoration of substantial damage of buildings and structures in flood hazard areas, shall be designed and constructed in accordance with the provisions contained in ~~this section~~ Chapter 19 of the *City Code*. Where a conflict exists between the *City Code* and this section, the provisions of the *City Code* shall prevail, and where a variance has been issued by the Floodplain Management Office, the provisions of the variance shall prevail over both the applicable terms of the *City Code* and this section. Buildings and structures that are in more than one flood hazard area shall comply with the provisions associated with the most restrictive flood hazard area. Buildings and structures located in whole or in part in identified floodways shall be designed and constructed in accordance with ASCE 24.	***City of Houston Amendment*** **Analysis:** The previous COH amendment of IRC 2012 Section R322.1 was modified to coordinate with City Code Chapter 19. Previous deletion of the model code reference to ASCE 24 is no longer included in the Houston changes to the model code. The Flood department confirmed that keeping the model code reference is needed for certain life-safety requirements specified by that reference standard. **Justification:** This amendment modified for clarity by legal and is needed to ensure conformity with state and local government policy and ordinances.
R322.3 Coastal high-hazard areas (including V Zones). Areas that have been determined to be subject to wave heights in excess of 3 feet (914 mm) or subject to high-velocity wave action or wave-induced erosion shall be designated as coastal high-hazard areas. Buildings and structures constructed in whole or in part in coastal high-hazard areas shall be designed and constructed in accordance with Sections R322.3.1 through R322.3.6. **R322.3.1 Location and site preparation.** **1.** New buildings and buildings that are determined to be substantially improved pursuant to Section R105.3.1.1, shall be located landward of the reach of mean high tide. **2.** For any alteration of sand dunes and mangrove stands the *building official* shall require submission of an engineering analysis which demonstrates that the proposed *alteration* will not increase the potential for flood damage. **R322.3.2 Elevation requirements.** **1.** All buildings and structures erected within coastal high-hazard areas shall be elevated so that the lowest portion of all structural members supporting the lowest floor, with the exception of piling, pile caps, columns, grade beams and bracing, is: **1.1.** Located at or above the design flood elevation, if the lowest horizontal structural member is oriented parallel to the direction of wave approach, where parallel shall mean less than or equal to 20 degrees (0.35 rad) from the direction of approach, or **1.2.** Located at the base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher, if the lowest horizontal structural member is oriented perpendicular to the direction of wave approach, where perpendicular shall mean greater than 20 degrees (0.35 rad) from the direction of approach.	**R322.3 Coastal high-hazard areas (including V Zones and Coastal A Zones, where designated).** Areas that have been determined to be subject to wave heights in excess of 3 feet (914 mm) or subject to high-velocity wave action or wave-induced erosion shall be designated as coastal high-hazard areas. Flood hazard areas that have been delineated as subject to wave heights between 1. feet (457 mm) and 3 feet (914 mm) or otherwise designated by the jurisdiction shall be designated as Coastal A Zones. Buildings and structures constructed in whole or in part in coastal high-hazard areas and in Coastal A Zones, where designated, shall be designed and constructed in accordance with Sections R322.3.1 through R322.3.7. ***(Some provisions in section not included for brevity and clarity.)*** **R322.3.3 Foundations.** All buildings and structures erected in coastal high-hazard areas and Coastal A Zones, shall be supported on pilings or columns and shall be adequately anchored to such pilings or columns. The space below the elevated building shall be either free of obstruction or, if enclosed with walls, the walls shall meet the requirements of Section R322.3.4. Piling shall have adequate soil penetrations to resist the combined wave and wind loads (lateral and uplift). Water loading values used shall be those associated with the design flood. Wind loading values shall be those required by this code. Pile embedment shall include consideration of decreased resistance capacity caused by scour of soil strata surrounding the piling. Pile systems design and installation shall be certified in accordance with Section R322.3.6. Spread footing, mat, raft, or other foundations that support columns shall not be permitted where soil investigations that are required in accordance with Section R401.4 indicate that soil material under the spread footing, mat, raft, or other foundation is subject to scour or erosion from wave–velocity flow conditions. If permitted, spread footing, mat, raft, or other foundations that support columns shall be designed in accordance with ASCE 24. Slabs, pools, pool decks, and walkways shall be located and constructed to be	***City of Houston Amendment*** **Analysis:** The previous COH amendment of IRC 2012 Section R322.1 was modified to coordinate with City Code Chapter 19. Previous deletion of the model code reference to ASCE 24 is no longer included in the Houston changes to the model code. The Flood department confirmed that keeping the model code reference is needed for certain life-safety requirements specified by that reference standard. Changes to the model code include Coastal A Zones defined and an exception for foundation types in Coastal A Zones is added. *CHANGE SIGNIFICANCE: Dwellings in areas designated as "Coastal A Zones" must meet the requirements of Section 322.3 for dwellings in coastal high-hazard areas (Zone V), including open foundations (pilings or columns), but they may have filled stemwalls as foundations.* *The Coastal A Zone (CAZ) has been in ASCE/SEI 7, Minimum Design Loads for Buildings and Other Structures, since the late 1990s and in ASCE/SEI 24, Flood Resistant Design and Construction, since its initial publication in 1998. Recognition of CAZ was added to the 2009 edition of the International Residential Code (IRC) in Section R322.2. CAZs had only one requirement: if an area subject to waves between 1.5 feet and 3 feet was delineated, then the area was designated a Coastal A Zone. The lowest floors were required to be at least 1 foot above the design flood elevation. Otherwise, the 2009 and 2012 IRC required dwellings in Coastal A Zones to comply with the requirements for Zone A.* *The inland boundary of the coastal high-hazard area (Zone V) is drawn by FEMA where breaking wave heights are expected to drop below 3 feet during base flood conditions. The requirements for foundations of dwellings that are located just landward of the Zone V boundary are assumed to be primarily affected by the waves. Waves, even waves that are 2.9 feet tall, are not significant. It had been assumed that conventional foundations such as perimeter walls could resist the wave loads and associated erosion and local scour.* *Post-disaster investigations after recent severe coastal storms have shown that in the area subject to waves between 1.5 feet and 3 feet, the area now referred to as "Coastal A Zone," significant damage may occur. FEMA reports have recommended implementing requirements for Zone V in Coastal A Zones. All coastal flood studies by FEMA now include analyses of moderate wave action and FIRMs show the Limit of Moderate Wave Action (LiMWA). An area defined as experiencing LiMWA is determined by a number of factors, including fetch (length of open water over which wind blows to generate waves), orientation of*

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2. Basement floors that are below *grade* on all sides are prohibited.
3. The use of fill for structural support is prohibited.
4. Minor grading, and the placement of minor quantities of fill, shall be permitted for landscaping and for drainage purposes under and around buildings and for support of parking slabs, pool decks, patios and walkways.

Exception: Walls and partitions enclosing areas below the design flood elevation shall meet the requirements of Sections R322.3.4 and R322.3.5.

R322.3.3 Foundations. Buildings and structures erected in coastal high-hazard areas shall be supported on pilings or columns and shall be adequately anchored to such pilings or columns. The space below the elevated building shall be either free of obstruction or, if enclosed with walls, the walls shall meet the requirements of Section R322.3.4. Pilings shall have adequate soil penetrations to resist the combined wave and wind loads (lateral and uplift). Water-loading values used shall be those associated with the design flood. Wind-loading values shall be those required by this code. Pile embedment shall include consideration of decreased resistance capacity caused by scour of soil strata surrounding the piling. Pile systems design and installation shall be certified in accordance with Section R322.3.6. Spread footing, mat, raft or other foundations that support columns shall not be permitted where soil investigations that are required in accordance with Section R401.4 indicate that soil material under the spread footing, mat, raft or other foundation is subject to scour or erosion from wave-velocity flow conditions. If permitted, spread footing, mat, raft or other foundations that support columns shall be designed in accordance with ASCE 24. Slabs, pools, pool decks and walkways shall be located and constructed to be structurally independent of buildings and structures and their foundations to prevent transfer of flood loads to the buildings and structures during conditions of flooding, scour or erosion from wave velocity flow conditions, unless the buildings and structures and their foundation are designed to resist the additional flood load.

structurally independent of buildings and structures and their foundations to prevent transfer of flood loads to the buildings and structures during conditions of flooding, scour, or erosion from wave-velocity flow conditions, unless the buildings and structures and their foundation are designed to resist the additional flood load.

Exception: In Coastal A Zones, stem wall foundations supporting a floor system above and backfilled with soil or gravel to the underside of the floor system shall be permitted provided the foundations are designed to account for wave action, debris impact, erosion, and local scour. Where soils are susceptible to erosion and local scour, stem wall foundations shall have deep footings to account for the loss of soil.

(Some provisions in section not included for brevity and clarity.)

Pier and beam construction in a coastal high-hazard area

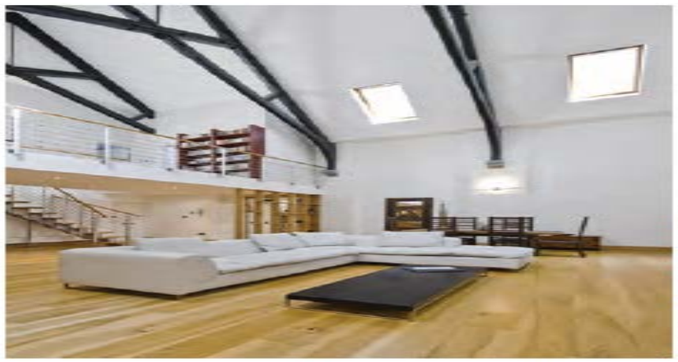
the shoreline to prevalent direction of wind and waves, land elevation relative to water depths, and the presence of dunes, buildings, and other elements of the landscape that have the effect of breaking up waves. Many reaches of shoreline subject to tidal flooding do not have conditions that produce moderate wave action, in which case the FIRM does not show a LiMWA.

The total land area that is likely to be designated as CAZ is small. Less than 3 percent of all mapped flood hazard areas are Zone V and the LiMWA is a relatively short distance inland from the Zone V boundary. Some communities currently augment the minimum NFIP requirements because of observed wave damage to conventional, closed foundations in this area of shallow wave action.

Observations after Superstorm Sandy continue to reinforce the damage potential in areas just inland of the Zone V boundary. Given that open foundations (piles and columns) perform well under velocity and wave conditions, dwellings in Coastal A Zones should meet the same requirements as dwellings in coastal high-hazard areas, except foundations of filled stemwalls that account for the potential for scour and erosion are allowed.

Justification: This amendment modified for clarity by legal and is needed to ensure conformity with state and local government policy and ordinances.

N/A



A mezzanine is not considered a story but must not exceed one-third of the floor area of the room where it is located.

SECTION R325
MEZZANINES

R325.1 General. Mezzanines shall comply with Section R325.

R325.2 Mezzanines. The clear height above and below mezzanine floor construction shall be not less than 7 feet (2,134 mm).

R325.3 Area limitation. The aggregate area of a mezzanine or mezzanines shall be not greater than one-third of the floor area of the room or space in which they are located. The enclosed portion of a room shall not be included in a determination of the floor area of the room in which the mezzanine is located.

R325.4 Means of egress. The means of egress for mezzanines shall comply with the applicable provisions of Section R311.

R325.5 Openness. Mezzanines shall be open and unobstructed to the room in which they are located except for walls not more than 42 inches (1,067 mm) in height, columns, and posts.

Exceptions:

City of Houston Amendment

Analysis: The model code added new provisions in Section R325 to place limitations on the construction of mezzanines related to ceiling height and openness with is intended to be consistent with the International Building Code (IBC). Mezzanines are not required to be considered as stories because they are limited in size and because they are subject to provisions that provide protection from fire hazards.

Section R301.2.2.3.1 indicates that mezzanines are not to be considered stories in the context of height limitations for buildings in higher seismic design categories. Mezzanines that are large in relation to the size of the story will act more like a story in response to seismic forces and, therefore, should be treated as stories. Otherwise, unsafe conditions could be created. Section R325.2 requires a clear height of at least 7 feet above and below mezzanines.

Section R325.3 includes specific provisions for determining the portion of a room that can be included in the allowable area of a mezzanine. The area of the mezzanine, or multiple mezzanines relative to any individual story, must not be greater than one-third of the area of the space in which they are located. Section R325.4 requires compliance with the means of egress requirements of Section R311.

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	1. Mezzanines or portions thereof are not required to be open to the room in which they are located, provided that the aggregate floor area of the enclosed space is not greater than 10 percent of the mezzanine area. **2.** In buildings that are no more than two stories above grade plane and equipped throughout with an automatic sprinkler system in accordance with NFPA 13R or NFPA 13D, a mezzanine having two or more means of egress shall not be required to be open to the room in which the mezzanine is located.	Section R325.5 specifies the minimum degree of openness that must be provided between a mezzanine and the room or story in which it is located. This provides early warning to occupants should a fire occur in either the mezzanine or in the room. The exceptions to Section R325.5 specify the conditions under which openness is not required. *CHANGE SIGNIFICANCE: In previous editions of the code, mezzanines and lofts were defined as intermediate levels with an aggregate floor area of not more than one-third of the area of the room or space in which they were located. In the height limitations provisions of Section R301.2.2.3 for buildings located in Seismic Design Categories D0, D1, and D2, mezzanines are not considered as stories. The intent is that mezzanines are not considered stories in Seismic Design Categories A, B, and C either, considering that the hazard for taller buildings is less in geographic locations where anticipated seismicity is lower. The only advantage for identifying a floor level as a mezzanine rather than a story under the IRC is to construct taller buildings. The scope of the IRC limits dwellings and townhouses to three stories above grade plane. Construction of a mezzanine could add a usable intermediate level or levels in addition to the three stories. Unlike the IBC, the IRC does not place limits on floor areas.* *A new section in the 2015 IRC establishes provisions for mezzanines consistent with the IBC provisions. The limitation for mezzanine size to not exceed one-third of the floor area of the room or space in which it is located has been moved out of the definition into the new section. The code now stipulates a minimum ceiling height of 7 feet for mezzanines that is consistent with the ceiling height provisions for habitable rooms and hallways in Section R305. Mezzanines are generally required to be open to the space in which they are located, but the code provides for a limited area to be enclosed. With the installation of sprinklers and two exits, mezzanines in two-story buildings are permitted to be enclosed. In most cases, floor levels in two-story buildings will be identified as stories rather than mezzanines and the mezzanine provisions will not apply. The term "loft" has been deleted from the definition because there are no provisions in the code for lofts.* **Justification:** Intended for consistency of terms and construction requirements and limitations between code volumes.
N/A	**R326.1 General.** The design and construction of pools and spas shall comply with the ~~*International*~~ *Swimming Pool and Spa Code*, Chapter 43 of the *City Code*, and Chapter 757 of the *Texas Health & Safety Code*.	***City of Houston Amendment*** **Analysis:** A COH amendment was added to coordinate with the Texas adoption of the 2018 Swimming Pool and Spa Code as the state minimum pool code which is also now adopted by the City. **Justification:** This amendment is needed to ensure conformity with state and local government policy.
2012 Houston IRC – Part 3—Chapter 4 through 10 Foundations	**2015 Houston IRC – Part 3— Chapter 4 through 10 Foundations**	**Code Analysis**
Part 3—Chapters 4 through 10 ***■ Chapter 4 Foundations; ■ Chapter 5 Floors; ■ Chapter 6 Wall Construction; ■ Chapter 7 Wall Covering; ■ Chapter 8 Roof-Ceiling Construction; ■ Chapter 9 Roof Assemblies; ■ Chapter 10 Chimneys and Fireplaces; No changes addressed*** *Chapters 4 through 10 address the prescriptive methods for building foundations, floor construction, wall construction, wall coverings, roof construction, roof assemblies, chimneys, and fireplaces. Concrete, masonry, and wood foundations; retaining walls; supporting soil properties; surface drainage; and foundation damp-proofing and drainage are found in Chapter 4. Chapters 5, 6, and 8 contain the construction provisions for floors, walls, and roofs, respectively, with most of the provisions addressing light-frame construction. Chapter 7 addresses interior finishes, such as drywall and plaster installations, and exterior wall coverings, including water-resistive barriers, flashings, siding, and veneer, to provide a durable weather-resistant exterior. Chapter 9 covers the various waterproof roof assemblies, including roofing underlayment, roof eave ice barrier, flashings, asphalt shingles, and other roof coverings. Site-built masonry fireplaces and chimneys as well as prefabricated fireplaces and chimneys, including their weather-tight roof terminations, are addressed in the provisions of Chapter 10. ■* ***R403.1.1**-Minimum Footing Size; **R403.1.2, R602.10.9.1**-Continuous Footings in Seismic Design Categories,D0,D1,and D2; **R403.1.3**-Footing and Stem Wall Reinforcing in Seismic Design; Categories D0, D1 and D2; **R403.1.6**-Foundation Anchorage; **R404.1.4.1**-Masonry Foundation Walls in SDC D0, D1 and D2; **R404.4**-Retaining Walls; **TABLES R502.3.1(1), R502.3.1(2)**-Floor Joist Spans for Common Lumber Species; **R502.10**-Framing of Floor Openings; **R507.1,R507.4**-Decking; **R507.2**-Deck Ledger Connection to Band Joist; **R507.2.4**-Alternative Deck Lateral Load Connection; **R507.5, R507.6, R507.7**-Deck Joists and Beams; **R507.8**-Deck Posts; **TABLE R602.3(1)**-Fastening Schedule—Roof Requirements; **TABLE R602.3(1)**-Fastening Schedule—Wall Requirements; **TABLE R602.3(1)**-Fastening Schedule—Floor Requirements; **R602.3.1**-Stud Size, Height, and Spacing; **R602.7**-Headers; **TABLER 602.10.3(1)**-Bracing Requirements Based on Wind Speed; **TABLE R602.10.5**-Contributing Length of Method CS-PF Braced; Wall Panels; **R602.10.6.2**-Method PFH: Portal Frame with Hold-downs; **R602.10.11**-Cripple Wall Bracing; **R602.12**-Simplified Wall Bracing; **R603.9.5**-Structural Sheathing over Steel Framing for Stone and Masonry Veneer; **R606**-Masonry Walls; **R606.3.5**-Grouting Requirements for Masonry Construction; **R610.7**-Drilling and Notching in Structural Insulated Panels; **R703.3**-Siding Material Thickness and Attachment; **R703.5**-Wood, Hardboard, and Wood Structural Panel Siding; **R703.6**-Wood Shakes and Shingles on Exterior Walls; **R703.9**-Exterior Insulation and Finish Systems (EIFS); **R703.11.1**-Vinyl Siding Attachment; **R703.13, R703.14**-Insulated Vinyl Siding and Polypropylene Siding; **R703.15, R703.16, R703.17**-Cladding Attachment over Foam Sheathing; **TABLES R802.4, R802.5**-Ceiling Joist and Rafter Tables; **R806.1**-Attic Ventilation; **TABLE R806.5**-Insulation for Condensation Control in Unvented Attics; **R905.1.1**-Underlayment; **R905.7.5**-Wood Shingle Application; **R905.8.6**-Wood Shake Application; **R905.16**-Photovoltaic Shingles; **R907**-Rooftop-Mounted Photovoltaic Systems*	
2012 Houston IRC – Chapter 4 Foundations	**2015 Houston IRC – Chapter 4 Foundations**	**Code Analysis**

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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401.5 Foundation elevation. All new buildings constructed within this jurisdiction shall have the finished floor of the building not less than 12 inches above the nearest sanitary sewer manhole rim of the sewer connected to the building, or, where no sewer is available, the finished floor shall not be less than 4 inches above the crown of the street. **Exception:** Buildings located in annexed subdivisions where the following conditions exist: 1. The subdivision was platted and recorded prior to annexation; 2. The sanitary sewer system for the subdivision was installed prior to annexation; and 3. The drainage piping meets the requirements of Section 710 of the *Plumbing Code*. **NOTE:** When a greater elevation is required by Chapter 19 of the *City Code*, then Chapter 19 shall govern.	**R401.5 Foundation elevation.** All new buildings constructed within this *jurisdiction* shall have the top of the finished floor of the first story of the building or structure elevated not less than 12 inches above the nearest sanitary sewer manhole rim of the sewer connected to and serving the building, or, where no sewer is available, the top of the finished floor of the first story of the building or structure shall be elevated not less than 4 inches above the crown of the street. **Exception:** Buildings located in annexed subdivisions where the following conditions exist: 1. The subdivision was platted and recorded prior to annexation; 2. The sanitary sewer system for the subdivision was installed prior to annexation; and 3. The drainage piping from a building meets the requirements of Section 710 of the *Plumbing Code*. **NOTE:** When a greater elevation is required by Chapter 19 of the *City Code* than under this section, then Chapter 19 of the *City Code* shall govern.	***City of Houston Amendment*** **Analysis:** The previous 2012 COH amendment includes minor editorial changes for clarity. No change to the code requirements or code intent. ***No change to the previous technical code requirements or code intent of this section.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
401.5.1 Plans and applications. All construction plans and applications submitted for construction, sewer connections or septic systems shall reflect the elevations of the finished floor of the building and the elevation of the nearest manhole rim of a sanitary sewer connected to the building or crown of the street, whichever is applicable.	**R401.5.1 Plans and applications.** All construction plans and applications submitted for construction, sewer connections or septic systems shall reflect the elevations of the finished floor of the building and the elevation of the nearest manhole rim of a sanitary sewer connected to the building or crown of the street, whichever is applicable.	***City of Houston Amendment*** **Analysis:** No change to the code requirements or code intent. **Justification:** This amendment is needed to ensure conformity with state and local government policy.
401.5.2 Damage risk. All *permits* for connection shall be issued on the condition that the owner take all the risk of damage that may result from water backing up into the premises from the sewer.	**R401.5.2 Damage risk.** All *permits* for connection shall be issued on the condition that the owner take all the risk of damage that may result from water backing up into the premises from the sewer.	***City of Houston Amendment*** **Analysis:** No change to the code requirements or code intent. **Justification:** This amendment is needed to ensure conformity with state and local government policy.
401.5.3 Existing structures. When an existing structure is required to connect with a public or private sewer, the finished floor shall be a minimum of 12 inches above the nearest sanitary sewer manhole rim of a sewer connected to the building. **Exception:** Where the public or private sewer is not of sufficient depth, or where structures required to be connected to the sewer cannot meet the minimum requirements of this section and other ordinances, the *building official* may authorize the issuance of a *permit* for an alternate method of construction or installation when this will not be detrimental to the health, welfare, and safety of the public.	**R401.5.3 Existing structures.** When an existing structure is required to connect with a public or private sewer, the finished floor shall be a minimum of 12 inches above the nearest sanitary sewer manhole rim of a sewer connected to the building. **Exception:** Where the public or private sewer is not of sufficient depth, or where structures required to be connected to the sewer cannot meet the minimum requirements of this section and other ordinances, the *building official* may authorize the issuance of a *permit* for an alternate method of construction or installation when this will not be detrimental to the health, welfare, and safety of the public.	***City of Houston Amendment*** **Analysis:** ***No change to the previous technical code requirements or code intent of this section.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
R403.1.1 Minimum size. Minimum sizes for concrete and masonry footings shall be as set forth in Table R403.1 and Figure R403.1(1). The footing width, W, shall be based on the load-bearing value of the soil in accordance with Table R401.4.1. Spread footings shall be at least 6 inches (152 mm) in thickness, T. Footing projections, P, shall be at least 2 inches (51 mm) and shall not exceed the thickness of the footing. The size of footings supporting piers and columns shall be based on the tributary load and allowable soil pressure in accordance with Table R401.4.1. Footings for wood foundations shall be in accordance with the details set forth in Section R403.2, and Figures R403.1(2) and R403.1(3).	**R403.1.1 Minimum size.** The minimum ~~sizes~~ width, W, and thickness, T, for concrete ~~and masonry~~ footings shall be ~~as set forth~~ in accordance with Tables R403.1(1) through R403.1(3) and Figure R403.1(1) or R403.1.3, as applicable. The footing width~~, W,~~ shall be based on the load-bearing value of the soil in accordance with Table R401.4.1. ~~Spread footings shall be at least 6 inches (152 mm) in thickness, T.~~ Footing projections, P, shall be ~~at least~~ not less than 2 inches (51 mm) and shall not exceed the thickness of the footing. Footing thickness and projection for fireplaces shall be in accordance with Section R1001.2. The size of footings supporting piers and columns shall be based on the tributary load and allowable soil pressure in accordance with Table R401.4.1. Footings for wood foundations shall be in accordance with the details set forth in Section R403.2, and Figures R403.1(2) and R403.1(3).	***City of Houston Amendment*** **Analysis:** This code change divides minimum footing size and thickness into three expanded tables based on the type of construction being supported: light frame, light frame with veneer, and concrete or masonry. The values are also based on the type of foundation: slab on grade, crawl space, or basement. *Change Significance: Due to concern that the 2012 IRC Table R403.1, covering minimum width of footings, was too conservative for concrete footings, the table for minimum footing size has been expanded into three tables. Loading conditions are clarified to more accurately determine the footing size required. The new minimum footing may be smaller, the same size, or larger than the 2012 IRC minimum footing size. Often the new minimum footing is slightly larger than the 2012 minimum for light-frame construction. For buildings with veneer, the minimum footing may be smaller.*

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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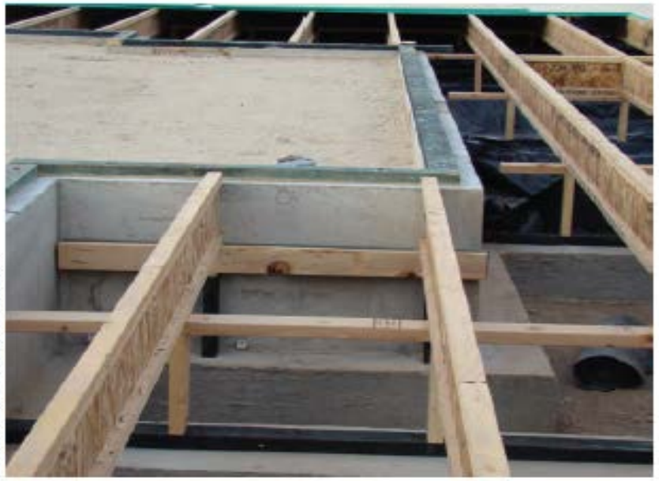

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Footing–stem wall

Photo Courtesy of Peter Kulczyk

Footing–basement wall

TABLE R403.1(1) Minimum Width and Thickness for Concrete Footings for Light Frame Construction (inches)[a, b]

Snow Load or Roof Live Load	Story and Type of Structure with Light Frame	Load-Bearing Value of Soil (psf) 1500	2000	2500	3000	3500	4000
20 psf	1 story - slab on grade	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story - with crawl space	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story - plus basement	18 × 6	14 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story - slab on grade	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story - with crawl space	16 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story - plus basement	22 × 6	16 × 6	13 × 6	12 × 6	12 × 6	12 × 6
	3 story - slab on grade	14 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	3 story - with crawl space	19 × 6	14 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	3 story - plus basement	25 × 8	19 × 6	15 × 6	13 × 6	12 × 6	12 × 6
30 psf	1 story - slab on grade	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story - with crawl space	13 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story - plus basement	19 × 6	14 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story - slab on grade	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story - with crawl space	17 × 6	13 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story - plus basement	23 × 6	17 × 6	14 × 6	12 × 6	12 × 6	12 × 6
	3 story - slab on grade	15 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	3 story - with crawl space	20 × 6	15 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	3 story - plus basement	26 × 8	20 × 6	16 × 6	13 × 6	12 × 6	12 × 6

(continues)

TABLE R403.1(1) (Continued)

Snow Load or Roof Live Load	Story and Type of Structure with Light Frame	Load-Bearing Value of Soil (psf) 1500	2000	2500	3000	3500	4000
50 psf	1 story - slab on grade	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story - with crawl space	16 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story - plus basement	21 × 6	16 × 6	13 × 6	12 × 6	12 × 6	12 × 6
	2 story - slab on grade	14 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story - with crawl space	19 × 6	14 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story - plus basement	25 × 7	19 × 6	15 × 6	12 × 6	12 × 6	12 × 6
	3 story - slab on grade	17 × 6	13 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	3 story - with crawl space	22 × 6	17 × 6	13 × 6	12 × 6	12 × 6	12 × 6
	3 story - plus basement	28 × 9	21 × 6	17 × 6	14 × 6	12 × 6	12 × 6
70 psf	1 story - slab on grade	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story - with crawl space	18 × 6	13 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story - plus basement	24 × 7	18 × 6	14 × 6	12 × 6	12 × 6	12 × 6
	2 story - slab on grade	16 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story - with crawl space	21 × 6	16 × 6	13 × 6	12 × 6	12 × 6	12 × 6
	2 story - plus basement	27 × 9	20 × 6	16 × 6	14 × 6	12 × 6	12 × 6
	3 story - slab on grade	19 × 6	14 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	3 story - with crawl space	25 × 7	18 × 6	15 × 6	12 × 6	12 × 6	12 × 6
	3 story - plus basement	30 × 10	23 × 6	18 × 6	15 × 6	13 × 6	12 × 6

a. Interpolation allowed. Extrapolation is not allowed.

b. Based on 32 foot wide house with load-bearing center wall that carries half of the tributary attic, and floor framing. For every 2 feet of adjustment to the width of the house add or subtract 2 inches of footing width and 1 inch of footing thickness (but not less than 6 inches thick).

The new tables are Table R403.1(1), light-frame construction; Table R403.1(2), light-frame construction with veneer; and Table R403.1(3), cast-in-place concrete or masonry construction. See the 2015 IRC for Tables R403.1(2) and R403.1(3). Note that the new tables apply to concrete footings only. The tables do not address grouted or solid masonry, crushed stone footings, or wood foundations.

Although not specifically stated in the code, for the 2012 IRC Table R403.1, footing size and depth were based upon the following assumptions:

- *Snow load of 50 psf*
- *20 feet of tributary roof area*
- *16 feet of tributary floor area*
- *10-foot first-floor height*
- *8-foot second- and third-floor heights*

The 2015 IRC minimum footing size tables are based on similar but not identical factors. The following assumptions are made:

- *Snow or roof live load of 20, 30, 50 or 70 psf (the maximum allowed prescriptively by the IRC in accordance with Section R301.2.3)*
- *18 feet of tributary roof area*
- *16 feet of tributary floor area*
- *8-foot third floor height*
- *9-foot second floor height*
- *10-foot first floor height*
- *3-foot crawlspace wall height*
- *10-foot basement wall height, 10-inch basement wall thickness, basement wall material weight of 125 pcf*

Footnote a allows interpolation of soil and snow load conditions. Footnote b accounts for an increase or decrease in building width, allowing a change in the footing width and thickness.

As displayed in the examples, the tables are based on the type of foundation. Categories include:

1. *One, two, and three stories built on a slab on grade (without a first-floor load),*
2. *One, two, and three stories built over a crawl space (with a first floor load and foundation wall/footing load), and*
3. *One, two, and three stories built with basement (with a first-floor load and basement wall load—previously, the table was silent on how to handle the extra load from a masonry or concrete basement wall).*

In the new tables, footing size increases for homes with a crawl space or basement.

The width of the footing is provided based on loads described above and the minimum footing projection. The tables are based on the following load case:

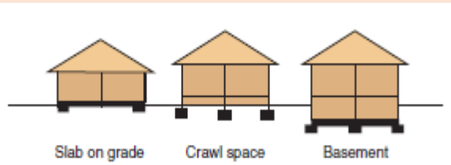
Total load (TL) equal to dead load (D) plus 75% of the snow or roof live load (S, L_R)

$$TL = D + .75(S \text{ or } L_R)$$

In combining the two loads, a reduction is allowed in the live load.

The minimum footing thickness is 6 inches, the minimum footing width is 12 inches. Calculation of footing size may result in a smaller footing but the code requires a minimum 12 3 6 or 12 inches wide and 6 inches deep footing.

Justification: This amendment is needed to ensure conformity with state and local government policy.



(Additional tables not shown for brevity.)

Analysis based on the following Files:

2021-1037 Exhibit G-1 2015 IRC Final-MH
2015 IRC

2012 IRC, Print 13
2012 Houston Amendments-ALL

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R403.1.2 Continuous footing in Seismic Design Categories D_0, D_1 and D_2. The *braced wall panels* at exterior walls of buildings located in Seismic Design Categories D_0, D_1 and D_2 shall be supported by continuous footings. All required interior *braced wall panels* in buildings with plan dimensions greater than 50 feet (15,240 mm) shall also be supported by continuous footings.

R602.10.9.1 Braced wall panel support for Seismic Design Category D2. In one-story buildings located in Seismic Design Category D_2, *braced wall panel*s shall be supported on continuous foundations at intervals not exceeding 50 feet (15 240 mm). In two-story buildings located in Seismic Design Category D_2, all *braced wall panel*s shall be supported on continuous foundations.

Exception: Two-story buildings shall be permitted to have interior *braced wall panel*s supported on continuous foundations at intervals not exceeding 50 feet (15,240 mm) provided that:

1. The height of cripple walls does not exceed 4 feet (1,219 mm).
2. First-floor *braced wall panel*s are supported on doubled floor joists, continuous blocking or floor beams.
3. The distance between bracing lines does not exceed twice the building width measured parallel to the *braced wall line*.

R403.1.2 Continuous footing in Seismic Design Categories D_0, D_1, and D_2. ~~The braced wall panels at~~ Exterior walls of buildings located in Seismic Design Categories D_0, D_1, and D_2 shall be supported by continuous solid or fully grouted masonry or concrete footings. Other footing materials or systems shall be designed in accordance with accepted engineering practice. All required interior braced wall panels in buildings located in Seismic Design Categories D_0, D_1, and D_2 with plan dimensions greater than 50 feet (15,240 mm) shall be supported by continuous solid or fully grouted masonry or concrete footings in accordance with Section R403.1.3.4, except for two-story buildings in Seismic Design Category D_2, in which all braced wall panels, interior and exterior, shall be supported on continuous foundations.

Exception: Two-story buildings shall be permitted to have interior braced wall panels supported on continuous foundations at intervals not exceeding 50 feet (15,240 mm) provided that:

1. The height of cripple walls does not exceed 4 feet (1,219 mm).
2. First-floor braced wall panels are supported on doubled floor joists, continuous blocking, or floor beams.
3. The distance between bracing lines does not exceed twice the building width measured parallel to the braced wall line.

TABLE 4-1 Continuous Footing Requirements in High-Seismic Regions

SDC	# of Stories	Wall Location	LENGTH OF PLAN DIMENSIONS: Both dimensions ≤50 ft.	LENGTH OF PLAN DIMENSIONS: One or more dimensions >50 ft.
D_0, D_1, D_2	One Story	Exterior Walls	Continuous footing required	Continuous footing required
		Interior Walls	No continuous footings required	Continuous footings required below all interior braced wall panels
D_0, D_1	Two Story	Exterior Walls	Continuous footing required	Continuous footing required
		Interior Walls	No continuous footings required	Continuous footings are required below all interior braced wall panels unless the Section R403.1.2 exception is used. Then interior wall lines with braced wall panels may be supported according to the exception with footings below interior braced wall panels spaced a maximum of 50 ft or less.
D_2	Two Story	Exterior Walls	Continuous footing required	Continuous footing required
		Interior Walls	Continuous footings are required below all interior braced wall panels unless the Section R403.1.2 exception is used.	Continuous footings are required below all interior braced wall panels unless the Section R403.1.2 exception is used. Then interior wall lines with braced wall panels may be supported according to the exception with footings below interior braced wall panels spaced a maximum of 50 ft. or less.

R602.10.9.1 Braced wall panel support for Seismic Design ~~Category~~ Categories D_0, D_1, and D_2. ~~In one-story buildings located in Seismic Design Category D2, braced wall panels shall be supported on continuous foundations at intervals not exceeding 50 feet (15,240 mm). In two-story buildings located in Seismic Design Category D2, all braced wall panels shall be supported on continuous foundations.~~ In Seismic Design Categories D_0, D_1, and D_2 braced wall panel footings shall be as specified in Section R403.1.2.

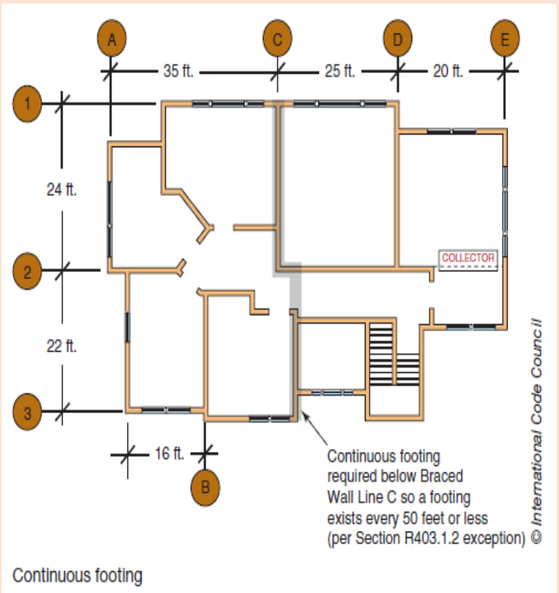
City of Houston Amendment

Analysis: This code change clarifies the continuous footing requirement in Section R403.1.2 and moves requirements in Section R602.10.9.1 to the foundation chapter.

Change Significance: In previous editions of the IRC, provisions in Chapters 4 and 6 for continuous footings and foundations were widely separated and confusing. In Section R602.10.9.1, there was no specific guidance on what to do in Seismic Design Categories (SDC) D0 and D1 below interior braced wall panels. This code change clarifies the foundation requirements under braced wall panels in all high-seismic regions. In previous IRC editions, the requirements for SDC D2 in the wall bracing section added to requirements in Section R403.1.2.

All requirements for footings in high-seismic regions are now located in Section R403.1.2 within the foundation chapter. Section R403.1.2 requires continuous footings for the cases listed in Table 4-1.

Justification: This amendment is needed to ensure conformity with state and local government policy.

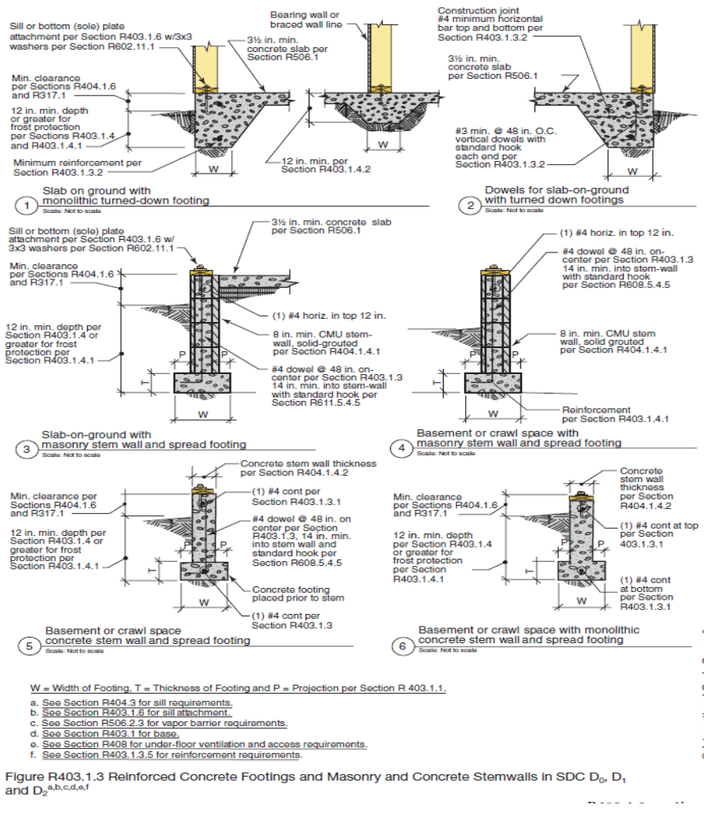


Continuous footing

Analysis based on the following Files:

2021-1037 Exhibit G-1 2015 IRC Final-MH
2015 IRC

2012 IRC, Print 13
2012 Houston Amendments-ALL

	~~**Exception:** Two-story buildings shall be permitted to have interior braced wall panels supported on continuous foundations at intervals not exceeding 50 feet (15,240 mm) provided that:~~ ~~**1.** The height of cripple walls does not exceed 4 feet (1,219 mm).~~ ~~**2.** First-floor braced wall panels are supported on doubled floor joists, continuous blocking or floor beams.~~ ~~**3.** The distance between bracing lines does not exceed twice the building width measured parallel to the braced wall line.~~	
 W = Width of Footing, T = Thickness of Footing and P = Projection per Section R 403.1.1. a. See Section R404.3 for sill requirements. b. See Section R403.1.6 for sill attachment. c. See Section R506.2.3 for vapor barrier requirements. d. See Section R403.1 for base. e. See Section R408 for under-floor ventilation and access requirements. f. See Section R403.1.3.5 for reinforcement requirements. Figure R403.1.3 Reinforced Concrete Footings and Masonry and Concrete Stemwalls in SDC D_0, D_1 and D_2[a,b,c,d,e,f]	**R403.1.3 ~~Seismic reinforcing~~ Footing and stem wall reinforcing in Seismic Design Categories D0, D1 and D2.** Concrete footings located in Seismic Design Categories D0, D1 and D2, as established in Table R301.2(1), shall have minimum reinforcement in accordance with this section and Figure R403.1.3. ~~Bottom r~~Reinforcement shall be ~~located~~ installed with support and cover in accordance with Section R403.1.3.5. ~~a minimum of 3 inches (76 mm) clear from the bottom of the footing.~~ **R403.1.3.1 Concrete stem walls with concrete footings.** **R403.1.3.2 Masonry stem walls with concrete footings.** **R403.1.3.3 Slabs-on-ground with turned-down footings.** **R403.1.3.4 Interior bearing and braced wall panel footings in Seismic Design Categories D_0, D_1, and D_2.** **R403.1.3.5 Reinforcement.** **R403.1.3.5.1 Steel reinforcement.** **R403.1.3.5.2 Location of reinforcement in wall.** **R403.1.3.5.3 Support and cover.** **R403.1.3.5.4 Lap splices.** **R403.1.3.6 Isolated concrete footings.**	***City of Houston Amendment*** **Analysis:** ***Clarification*** **–** Updated figures and code provisions in Section R403.1.3 now clearly define minimum required reinforcement in footings and stem walls located in Seismic Design Categories (SDC) D0, D1, and D2. ***Change Significance:*** *Revisions of the title and language in Section R403.1.3 are done for clarity. A note is added that references new Section R403.1.3.5 clarifying material and installation requirements for reinforcement. Existing language describing concrete stem walls and masonry stem walls on concrete footings is separated into two sections: Section R403.1.3.1, Concrete stem walls, and Section R403.1.3.2, Masonry stem walls.* *Section R403.1.3.3 for slabs on ground is updated to clarify that the section addresses turned-down footings cast monolithically with the slab. Reinforcement installed in the middle third of the footing is moved into the section instead of being an exception.* *Section R403.1.3.5.3 Support and cover is a new section, moved from 2012 IRC Section R404.1.2.3.7.4, covering all concrete clearance and support.* *The footing figures in Section R403.1 are revised and updated. The graphic quality of the figures is improved and additional information helpful to the code user is added. For the first time, a set of figures shows minimum footing size and applicable reinforcement requirements for SDC D0, D1, and D2 in Figure R403.1.3.* **Justification:** This amendment is needed to ensure conformity with state and local government policy.
R403.1.6 Foundation anchorage. Sill plates and walls supported directly on continuous foundations shall be anchored to the foundation in accordance with this section. Wood sole plates at all exterior walls on monolithic slabs, wood sole plates of *braced wall panels* at building interiors on monolithic slabs and all wood sill plates shall be anchored to the foundation with anchor bolts spaced a maximum of 6 feet (1829 mm) on center. Bolts shall be at least 1/2 inch (12.7 mm) in diameter and shall extend a minimum of 7 inches (178 mm) into concrete or grouted cells of concrete masonry units. A nut and washer shall be tightened on each anchor bolt. There shall be a minimum of two bolts per plate section with one bolt located not more than 12 inches (305 mm) or less than seven bolt diameters from each end of the plate section. Interior bearing wall sole plates on monolithic slab foundation that are not part of a *braced wall panel* shall be positively anchored with *approved* fasteners. Sill	**R403.1.6 Foundation anchorage.** Wood sill plates and wood walls supported directly on continuous foundations shall be anchored to the foundation in accordance with this section. Cold-formed steel framing shall be anchored directly to the foundation or fastened to wood sill plates anchored to the foundation. Anchorage of cold-formed steel framing and sill plates supporting cold-formed steel framing shall be in accordance with this section and Section R505.3.1 or R603.3.1. Wood sole plates at all exterior walls on monolithic slabs, wood sole plates of *braced wall panels* at building interiors on monolithic slabs and all wood sill plates shall be anchored to the foundation with minimum 1/2-inch diameter (12.7 mm) anchor bolts spaced a maximum of 6 feet (1,829 mm) on center or *approved* anchors or anchor straps spaced as required to provide equivalent	***City of Houston Amendment*** **Analysis:** Anchor bolts are now required to be placed in the middle third of the sill plate. Approved anchors may be used instead of ½-inch anchor bolts. ***No change to the previous code intent of this section.*** *Change Significance: It is common to see an anchor bolt placed near the edge of a wood sole plate. The general industry standard is for the bolt to be located at least two bolt diameters from the plate's edge, but there have been no provisions in the IRC to govern edge distance. Requirements of the 2012 IRC included two bolts per plate, within 12 inches of the end of the plate, and spaced no more than 6 feet apart. Adding a requirement for placement of a bolt within the middle third of the wood plate width allows some flexibility while providing for a minimum edge distance.* *Testing has demonstrated that a bolt loses anchoring capacity when placed closer than 1. inches from the plate's edge. Manufacturers of anchor bolts require a minimum plate edge distance of 1. inches in their installation and technical documents. This code change places an anchor bolt at least 11/8 inches

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plates and sole plates shall be protected against decay and termites where required by Sections R317 and R318. Cold-formed steel framing systems shall be fastened to wood sill plates or anchored directly to the foundation as required in Section R505.3.1 or R603.3.1.

Exceptions:

1. Foundation anchorage, spaced as required to provide equivalent anchorage to 1/2-inch-diameter (12.7 mm) anchor bolts.
2. Walls 24 inches (610 mm) total length or shorter connecting offset *braced wall panels* shall be anchored to the foundation with a minimum of one anchor bolt located in the center third of the plate section and shall be attached to adjacent *braced wall panels* at corners as shown in item 8 of Table R602.3(1).
3. Connection of walls 12 inches (305 mm) total length or shorter connecting offset *braced wall panels* to the foundation without anchor bolts shall be permitted. The wall shall be attached to adjacent *braced wall panels* at corners as shown in item 8 of Table R602.3(1).

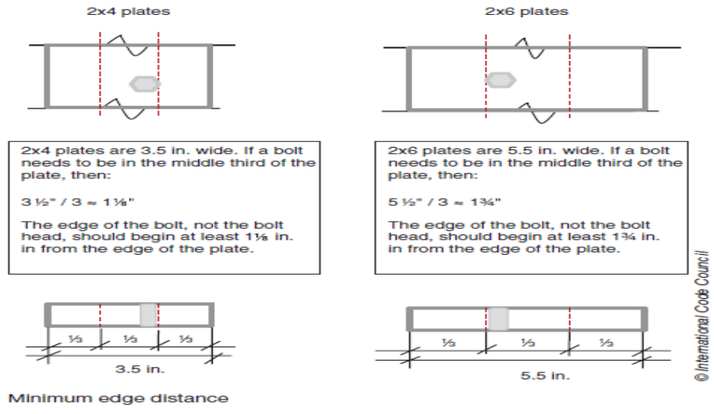
Photo Courtesy of Peter Kulczyk

Alternate anchorage

anchorage to 1/2-inch-diameter (12.7 mm) anchor bolts. Bolts shall extend a minimum of 7 inches (178 mm) into concrete or grouted cells of concrete masonry units. The bolts shall be located in the middle third of the width of the plate. A nut and washer shall be tightened on each anchor bolt. There shall be a minimum of two bolts per plate section with one bolt located not more than 12 inches (305 mm) or less than seven bolt diameters from each end of the plate section. Interior bearing wall sole plates on monolithic slab foundation that are not part of a *braced wall panel* shall be positively anchored with *approved* fasteners. Sill plates and sole plates shall be protected against decay and termites where required by Sections R317 and R318.

Exceptions:

1. Walls 24 inches (610 mm) total length or shorter connecting offset braced wall panels shall be anchored to the foundation with a minimum of one anchor bolt located in the center third of the plate section and shall be attached to adjacent braced wall panels at corners as shown in Item 9 of Table R602.3(1).
2. Connection of walls 12 inches (305 mm) total length or shorter connecting offset *braced wall panels* to the foundation without anchor bolts shall be permitted. The wall shall be attached to adjacent braced wall panels at corners as shown in Item 9 of Table R602.3(1).



Minimum edge distance

from the edge of a 2 3 4 sill plate. With 2 3 6 construction the bolt is a minimum of 1. inches from the plate edge.

Foundation anchorage requirements for alternate foundation anchor systems providing equivalent capacity to ½-inch anchor bolts spaced at 6 feet on center (or as otherwise required by the code or design) are moved from the exceptions into the main text. Revised language is like the 2012 International Building Code (IBC) Section 2308.6. The provision allows use of anchors such as foundation anchors (mudsill anchors), wedge anchors, expansion anchors, adhesive anchors, and other alternatives approved by the building official as alternates to cast-in-place anchor bolts within Section R403.1.6.

Anchorage requirements for cold-formed steel framing systems have been separated from the requirements for wood. The new provision points to appropriate cold-formed steel provisions in Chapters 5 (Floors) and 6 (Walls). In addition, language is revised to clarify that both provisions of Section R403.1.6 and the applicable provisions of Section R505.3.1 (for cold-formed steel floor framing) and Section R603.3.1 (for cold-formed steel wall framing) need to be followed. The change adds a pointer to anchor bolt spacing and embedment requirements specific to cold-formed steel.

Justification: This amendment is needed to ensure conformity with state and local government policy.

Anchor bolt placement – centered in sill plate

R404.1.2 Concrete foundation walls. Concrete foundation walls that support light-frame walls shall be designed and constructed in accordance with the provisions of this section, ACI 318, ACI 332 or PCA 100. Concrete foundation walls that support above-grade concrete walls that are within the applicability limits of Section R611.2 shall be designed and constructed in accordance with the provisions of this section, ACI 318, ACI 332 or PCA 100. Concrete foundation walls that support above-grade concrete walls that are not within the applicability limits of Section R611.2 shall be designed and constructed in accordance with the provisions of ACI 318, ACI 332 or PCA 100. ~~When ACI 318, ACI 332, PCA 100 or the provisions of this section are used to design concrete foundation walls, project drawings, typical details and specifications are not required to bear the seal of the architect or engineer responsible for design, unless otherwise required by the state law of the *jurisdiction* having authority.~~

R404.1.3 Concrete foundation walls. Concrete foundation walls that support light-frame walls shall be designed and constructed in accordance with the provisions of this section, ACI 318, ACI 332 or PCA 100. Concrete foundation walls that support above-grade concrete walls that are within the applicability limits of Section R608.2 shall be designed and constructed in accordance with the provisions of this section, ACI 318, ACI 332 or PCA 100. Concrete foundation walls that support above-grade concrete walls that are not within the applicability limits of Section R608.2 shall be designed and constructed in accordance with the provisions of ACI 318, ACI 332 or PCA 100. ~~When ACI 318, ACI 332, PCA 100 or the provisions of this section are used to design concrete foundation walls, project drawings, typical details and specifications are not required to bear the seal of the architect or engineer responsible for design, unless otherwise required by the state law of the *jurisdiction having authority*.~~

City of Houston Amendment

Analysis: The code provisions of the model code and the COH amendment moved from IRC 2012 Section R404.1.2 to this section. ***No change to the previous technical code requirements or code intent of this section.***

Justification: This amendment is necessary to ensure that applicable drawings contain the appropriate seals of the architects or engineers responsible for their design. The amendment was previously located in R404.1.2.

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R404.1.4 Seismic Design Category D0, D1 or D2.

R404.1.4.1 Masonry foundation walls. In addition to the requirements of Table R404.1.1(1) plain masonry foundation walls in buildings assigned to Seismic Design Category D0, D1 or D2, as established in Table R301.2(1), shall comply with the following.

1. Wall height shall not exceed 8 feet (2,438 mm).
2. Unbalanced backfill height shall not exceed 4 feet (1,219 mm).
3. Minimum nominal thickness for plain masonry foundation walls shall be 8 inches (203 mm).
4. Masonry stem walls shall have a minimum vertical reinforcement of one No. 3 (No. 10) bar located a maximum of 4 feet (1,219 mm) on center in grouted cells. Vertical reinforcement shall be tied to the horizontal reinforcement in the footings.

Foundation walls in buildings assigned to Seismic Design Category D0, D1 or D2, as established in Table R301.2(1), supporting more than 4 feet (1,219 mm) of unbalanced backfill or exceeding 8 feet (2,438 mm) in height shall be constructed in accordance with Table R404.1.1(2), R404.1.1(3) or R404.1.1(4). Masonry foundation walls shall have two No. 4 (No. 13) horizontal bars located in the upper 12 inches (305 mm) of the wall.

R404.1.4 Seismic Design Category D0, D1 or D2.

R404.1.4.1 Masonry foundation walls. In buildings assigned to Seismic Design Category D0, D1 or D2, as established in Table R301.2(1), masonry foundation walls shall comply with this section. In addition to the requirements of Table R404.1.1(1), plain masonry foundation walls shall comply with the following:

1. Wall height shall not exceed 8 feet (2,438 mm).
2. Unbalanced backfill height shall not exceed 4 feet (1,219 mm).
3. Minimum nominal thickness for plain masonry foundation walls shall be 8 inches (203 mm).
4. Masonry stem walls shall have a minimum vertical reinforcement of one No. 4 (No. 13) bar located a maximum of 4 feet (1,219 mm) on center in grouted cells. Vertical reinforcement shall be tied to the horizontal reinforcement in the footings.

Foundation walls, supporting more than 4 feet (1,219 mm) of unbalanced backfill or exceeding 8 feet (2,438 mm) in height shall be constructed in accordance with Table R404.1.1(2), R404.1.1(3) or R404.1.1(4). Masonry foundation walls shall have two No. 4 (No. 13) horizontal bars located in the upper 12 inches (305 mm) of the wall.

Masonry foundation wall

City of Houston Amendment

Analysis: Minimum vertical reinforcement in masonry (CMU) stem walls has been increased from No. 3 bars to No. 4 bars spaced a maximum of 4 feet on center in grouted cells.

Change Significance: This code change clarifies requirements for masonry and concrete foundation walls by following the same format in each section. For masonry, the minimum vertical reinforcement is increased from one No. 3 bar to one No. 4 bar for seismic reinforcement in SDC D0, D1, and D2.

In Section 1.18.4.4 of TMS 402/ACI 530/ASCE 5, Building Code Requirements for Masonry Structures and Commentary, the adopted standard for masonry design, vertical reinforcement is required to be at least a No. 4 bar spaced a maximum of 48 inches on center. The IRC now agrees with the standard referenced throughout the masonry sections of the IRC.

Table R404.1.1(1) is updated to differentiate between solid and grouted masonry in plain masonry walls for minimum wall thickness. In general, with good soils, minimum wall thickness for plain masonry walls with solid masonry is 6 inches and minimum thickness for grouted masonry is 8 inches. With poor soils—loosely compacted soils made of clays, silts, and organics—minimum wall thickness can be as large as 12 inches. See 2015 IRC Table R404.1.1(1).

Justification: This IRC changed to coincide with the structural reinforcement requirements specified in the reference masonry structures standard.

R404.4 Retaining walls. Retaining walls that are not laterally supported at the top and that retain in excess of 24 inches (610 mm) of unbalanced fill shall be designed to ensure stability against overturning, sliding, excessive foundation pressure and water uplift. Retaining walls shall be designed for a safety factor of 1.5 against lateral sliding and overturning.

R404.4 Retaining walls. Retaining walls that are not laterally supported at the top and that retain in excess of ~~24~~ 48 inches (~~610~~ 1219 mm) of unbalanced fill, or retaining walls exceeding 24 inches (610 mm) in height that resist lateral loads in addition to soil, shall be designed in accordance with accepted engineering practice to ensure stability against overturning, sliding, excessive foundation pressure, and water uplift. Retaining walls shall be designed for a safety factor of 1.5 against lateral sliding and overturning. This section shall not apply to foundation walls supporting buildings.

City of Houston Amendment

Analysis: ***Modification –*** Retaining walls, freestanding walls not supported at the top, with more than 48 inches of unbalanced backfill must be designed by an engineer. Retaining walls resisting additional lateral loads and with more than 24 inches of unbalanced backfill must also be designed in accordance with accepted engineering practice.

Change Significance: The type of wall addressed in Section R404.4 is a detached retaining wall of concrete or hollow, grouted or solid masonry, not supported at the top and laterally supported at the bottom against sliding and overturning by a footing covered by soil. The wall would typically be a site retaining wall primarily resisting lateral soil loads. When the wall must resist additional loads, such as vehicles parked above or fences built on top of the wall that are subject to wind loads, a wall with more than 24 inches of unbalanced backfill must be designed in accordance with accepted engineering practice.

Section R404.4 also has a new trigger height of 48 inches (previously 24 inches) for unbalanced backfill to be consistent with Section R404.1.3. This section specifically requires that concrete or masonry foundation walls supporting more than 48 inches of unbalanced fill and not laterally supported must have an engineered design.

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	 Photo Courtesy of Peter Kulczyk Retaining wall	*The definition of a retaining wall within the provision is modified to clarify that this type of wall is not intended to support structural loads. A similar wall that does support structural loads is addressed by other sections.* **Justification:** This IRC changed to coincide with the structural reinforcement requirements specified in the reference masonry structures standard.
2012 Houston IRC – Chapter 5 Floors	**2015 Houston IRC – Chapter 5 Floors**	**Code Analysis**
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 (12.7 mm) gypsum wallboard membrane, ⅝-inch (16 mm) wood structural panel membrane, or equivalent on the underside of the floor framing member where the underside of the floor framing is exterior to the building or is exposed to a room below. **Exceptions:** **5.** 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. **6.** Floor assemblies located directly over a crawl space not intended for storage or fuel-fired appliances. **7.** Portions of floor assemblies can be unprotected when complying with the following: **3.3** The aggregate area of the unprotected portions shall not exceed 80 square feet per story **3.4** 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. **8.** Wood floor assemblies using dimension lumber or structural composite lumber equal to or greater than 2-inch by 10-inch (50.8 mm by 254 mm) nominal dimension, or other approved floor assemblies demonstrating equivalent fire performance.	**N/A – Previous COH amendment relocated to the model code Section R302.13.**	***City of Houston Amendment*** **Analysis:** This section has been relocated in the model code to Section R302.13 in the IRC 2015 Edition. The COH amendment was omitted. **Justification:** The committee recommends omitting this amendment as it was created to clarify the language of the section but does not accomplish this purpose. This section has been relocated in the model code to Section R302.13 in the IRC 2015 Edition.
Tables R502.3.1(1) and R502.3.1(2)	**Tables R502.3.1(1) and R502.3.1(2)** **TABLE R502.3.1(1)** **FLOOR JOIST SPANS FOR COMMON LUMBER SPECIES** **(Residential sleeping areas, live load = 30 psf, L/Δ = 360) [a]**	***City of Houston Amendment*** **Analysis:** Changes to Southern Pine (SP), Douglas Fir-Larch (DFL), and Hemlock Fir (HF) lumber capacities have changed the floor joist span length in the prescriptive tables of the IRC. Span lengths for Southern Pine have decreased; lengths for DFL and HF joists have increased. *Change Significance: New design values exist for Southern Pine lumber. These design values for all widths and grades of visually graded Southern Pine lumber became effective on June 1, 2013. The American Lumber Standards Committee (ALSC) approved the new design values as published in Southern Pine Inspection Bureau Supplement No. 13 to the 2002 Standard Grading Rules for Southern*

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Example—Floor Spans

#1 Bedroom
Dead load = 10 psf
2×10 joists
16" o.c. spacing
Southern Pine (SP) #2

Maximum Span Allowed	2012	2015
	18′-0"	15′-8"

The SP #2 span length is significantly reduced from the 2012 IRC span length.

Note: An SP #1 joist will span about the same length in the 2015 IRC Table R502.3.1(1) or R502.3.1(2) as the SP #2 did in the tables in the 2012 IRC.

#2 Bathroom
Dead load = 20 psf
2×8 joists
16" o.c. spacing
Douglas Fir-Larch (DFL) #2

Maximum Span Allowed	2012	2015
	11′-6"	11′-8"

The span has increased about 2 inches which is the typical increase in the table. Some cells for Douglas Fir and Hemlock have not changed. Others increased by 1-2 inches.

Floor joist span examples

TABLE R502.3.1(1) Floor Joist Spans for Common Lumber Species (Residential sleeping areas, live load = 30 psf, L/Δ = 360)[a]

Joist Spacing (inches)	Species and Grade		Dead Load = 10 psf 2 × 6 (ft - in.)	2 × 8 (ft - in.)	2 × 10 (ft - in.)	2 × 12 (ft - in.)	Dead Load = 20 psf 2 × 6 (ft - in.)	2 × 8 (ft - in.)	2 × 10 (ft - in.)	2 × 12 (ft - in.)
			Maximum floor joist spans							
12	Douglas fir-larch	SS	12-6	16-6	21-0	25-7	12-6	16-6	21-0	25-7
	Douglas fir-larch	#1	12-0	15-10	20-3	24-8	12-0	15-7	19-0	22-0
	Douglas fir-larch	#2	11-10	15-7	19-10	23-4	11-8	14-9	18-0	20-11
	Douglas fir-larch	#3	9-11	12-7	15-5	17-10	8-11	11-3	13-9	16-0
	Hem-fir	SS	11-10	15-7	19-10	24-2	11-10	15-7	19-10	24-2
	Hem-fir	#1	11-7	15-3	19-5	23-7	11-7	15-3	18-9	21-9
	Hem-fir	#2	11-0	14-6	18-6	22-6	11-0	14-4	17-6	20-4
	Hem-fir	#3	9-8	12-4	15-0	17-5	8-8	11-0	13-5	15-7
	Southern pine	SS	12-3	16-2	20-8	25-1	12-3	16-2	20-8	25-1
	Southern pine	#1	11-10	15-7	19-10	24-2	11-10	15-7	18-7	22-0
	Southern pine	#2	11-3	14-11	18-1	21-4	10-9	13-8	16-2	19-1
	Southern pine	#3	9-2	11-6	14-0	16-6	8-2	10-3	12-6	14-9
	Spruce-pine-fir	SS	11-7	15-3	19-5	23-7	11-7	15-3	19-5	23-7
	Spruce-pine-fir	#1	11-3	14-11	19-0	23-0	11-3	14-7	17-9	20-7
	Spruce-pine-fir	#2	11-3	14-11	19-0	23-0	11-3	14-7	17-9	20-7
	Spruce-pine-fir	#3	9-8	12-4	15-0	17-5	8-8	11-0	13-5	15-7

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

Note: Check sources for availability of lumber in lengths greater than 20 feet.

a. Dead load limits for townhouses in Seismic Design Category C and all structures in Seismic Design Categories D_0, D_1, and D_2 shall be determined in accordance with Section R301.2.2.2.1.

(Portions of table not show for brevity and clarity.)

Pine Lumber. Values are a result of two years of testing current lumber available on the market to identify what changes had occurred in the strength of the Southern Pine lumber inventory. Meanwhile, for Douglas Fir-Larch and Hemlock Fir, testing done in the 1990s slightly increased design values for bending. Revised design values for Select Structural, #2 and #3 grades of Douglas Fir-Larch, and #1 grade of Hemlock Fir increased by 25 psi. Testing to check current stock has validated the design values set in the 1990s. Although these values were updated in the wood standards, span tables incorporated into the 2000 International Building Code (IBC) and 2000 IRC were based on span tables predating the revised design values from the 1990s. The 2015 IRC span tables will now agree with the wood standards' span tables with the revisions for Southern Pine, Douglas Fir-Larch, and Hemlock Fir. The new design values apply only to new construction. The integrity of existing structures designed and built using design values meeting the applicable building codes in effect at the time of permitting is not a concern. For Southern Pine, the changes reflect shorter spans. For Douglas Fir-Larch and Hemlock Fir, the changes result in slightly longer spans.

Justification: This Table has been updated based on AWC and the National Forestry data in the IRC 2015 Edition.

Lumber floor joists

R502.10 Framing of openings. Openings in floor framing shall be framed with a header and trimmer joists. When the header joist span does not exceed 4 feet (1,219 mm), the header joist may be a single member the same size as the floor joist. Single trimmer joists may be used to carry a single header joist that is located within 3 feet (914 mm) of the trimmer joist bearing. When the header joist span exceeds 4 feet (1,219 mm), the trimmer joists and the header joist shall be doubled and of sufficient cross section to support the floor joists framing into the header. *Approved* hangers shall be used for the header joist to trimmer joist connections when the header joist span exceeds 6 feet (1,829 mm). Tail joists over 12 feet (3,658 mm) long shall be supported at the header by framing anchors or on ledger strips not less than 2 inches by 2 inches (51 mm by 51 mm).

R502.10 Framing of openings. Openings in floor framing shall be framed with a header and trimmer joists. ~~When~~ Where the header joist span does not exceed 4 feet (1,219 mm), the header joist may be a single member the same size as the floor joist. Single trimmer joists may be used to carry a single header joist that is located within 3 feet (914 mm) of the trimmer joist bearing. When the header joist span exceeds 4 feet (1,219 mm), the trimmer joists and the header joist shall be doubled and of sufficient cross section to support the floor joists framing into the header. ~~Approved hangers shall be used for the header joist to trimmer joist connections when the header joist span exceeds 6 feet (1,829 mm). Tail joists over 12 feet (3,658 mm) long shall be supported at the header by framing anchors or on ledger strips not less than 2 inches by 2 inches (51 mm by 51 mm).~~

City of Houston Amendment

Analysis: Requirements for header joist and trimmer connections in the framing of floor openings have been deleted. This section conflicted with Section R502.6, which contains minimum bearing lengths for all joists and headers.

Change Significance: There was conflicting language in the 2012 IRC regarding support of framing members at floor openings. Section R502.10 required that header joists be provided with approved hangers only when they exceeded 6 feet in length and that joists be supported on framing anchors or ledger strips only when they were over 12 feet long.

Section R502.6 requires all joists, beams, and girders to have not less than 1.5 inches of bearing regardless of length. Applying 2012 IRC language literally, a 10-foot-long joist framed into a stairway opening at one end and into the face of a beam at the other would require a joist hanger where it connects to the beam but not at the stairway header. The loads are assumed to be distributed evenly along the joist. After deleting the language in Section R502.10, framing at openings now has the same bearing requirements as other joists per R502.6.

Justification: This Table has been updated based on AWC and the National Forestry data in the IRC 2015 Edition.

R507.1 Decks. Where supported by attachment to an exterior wall, decks shall be positively anchored to the primary structure and designed for both vertical and lateral loads.

R507.1 Decks. Wood-framed decks shall be in accordance with this section or Section R301 for materials and conditions not prescribed herein. Where supported by attachment to an exterior wall, decks shall be positively anchored to the primary structure and designed for both vertical and lateral loads.

City of Houston Amendment

Analysis: The IRC 2015 code now sets the maximum allowable spacing for deck joists supporting various types of common decking materials.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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Such attachment shall not be accomplished by the use of toenails or nails subject to withdrawal. Where positive connection to the primary building structure cannot be verified during inspection, decks shall be self-supporting. For decks with cantilevered framing members, connections to exterior walls or other framing members, shall be designed and constructed to resist uplift resulting from the full live load specified in Table R301.5 acting on the cantilevered portion of the deck.

Such attachment shall not be accomplished by the use of toenails or nails subject to withdrawal. Where positive connection to the primary building structure cannot be verified during inspection, decks shall be self-supporting. For decks with cantilevered framing members, connections to exterior walls or other framing members shall be designed and constructed to resist uplift resulting from the full live load specified in Table R301.5 acting on the cantilevered portion of the deck.

R507.4 Decking. Maximum allowable spacing for joists supporting decking shall be in accordance with Table R507.4. Wood decking shall be attached to each supporting member with not less than (2) 8d threaded nails or (2) No. 8 wood screws.

TABLE R507.4 Maximum joist spacing

Material type and nominal size	Maximum on-center joist spacing	
	Perpendicular to joist	Diagonal to joist[a]
1¼-inch thick wood	16 inches	12 inches
2-inch thick wood	24 inches	16 inches
Plastic composite	In accordance with Section R507.3	In accordance with Section R507.3

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 degree = 0.01745 rad.

a. Maximum angle of 45 degrees from perpendicular for wood deck boards

Change Significance: The new Table R507.4 sets the maximum joist spacing for support of decking materials. The spacing is based on the type and thickness of the decking material and its orientation to the joist. Decking placed diagonally to the direction of the joists must span a greater distance than decking installed perpendicular to the joists. Therefore, a diagonal installation requires reduced spacing of the supports. The joist spacing values reflect current construction conventions and recommended best practices. The new table mirrors the organization and format of Table R503.1, Minimum Thickness of Lumber Floor Sheathing Based on the Support Spacing. However, the new spacing values for support of decking are based on typical decking materials which perform satisfactorily in deck construction and match current construction practices. Lumber decking with a 2-inch nominal thickness allows a joist spacing of 24 inches on center when applied perpendicular to the supports and 16 inches on center when applied diagonally. For nominal 1.-inch wood decking, the spacing is reduced to 16 inches and 12 inches, respectively. Plastic composite decking must comply with the requirements of ASTM D7032 and be installed in accordance with the manufacturer's instructions, as prescribed in Section R507.3.

Justification: This Table has been updated based on AWC and the National Forestry data in the IRC 2015 Edition.

R507.2 Deck ledger connection to band joist. For decks supporting a total design load of 50 pounds per square foot (2,394 Pa) [40 pounds per square foot (1,915 Pa) live load plus 10 pounds per square foot (479 Pa) dead load], the connection between a deck ledger of pressure-preservative-treated Southern Pine, incised pressure-preservative-treated Hem-Fir or *approved* decay-resistant species, and a 2-inch (51 mm) nominal lumber band joist bearing on a sill plate or wall plate shall be constructed with 1/2-inch (12.7 mm) lag screws or bolts with washers in accordance with Table R507.2. Lag screws, bolts and washers shall be hot-dipped galvanized or stainless steel.

R507.2.1 Placement of lag screws or bolts in deck ledgers and band joists. The lag screws or bolts in deck ledgers and band joists shall be placed in accordance with Table R507.2.1 and Figures R507.2.1(1) and R507.2.1(2).

R507.2.2 Alternate deck ledger connections. Deck ledger connections not conforming to Table R507.2 shall be designed in accordance with accepted engineering practice. Girders supporting deck joists shall not be supported on deck ledgers or band joists. Deck ledgers shall not be supported on stone or masonry veneer.

R507.2.3 Deck lateral load connection. The lateral load connection required by Section R507.1 shall be permitted to be in accordance with Figure R507.2.3. Where the lateral load connection is provided in accordance with Figure 507.2.3, hold-down tension devices shall be installed in not less than two locations per deck, and each device shall have an allowable stress design capacity of not less than 1,500 pounds (6,672 N).

R507.3 Wood/plastic composites. Wood/plastic composites used in exterior deck boards, stair treads, handrails and guardrail systems shall bear a label indicating the required performance levels and demonstrating compliance with the provisions of ASTM D 7032.

R507.2 Deck ledger connection to band joist. Deck ledger connections to band joists shall be in accordance with this section, Tables R507.2 and R507.2.1, and Figures R507.2.1(1) and R507.2.1(2). For other grades, species, connection details and loading conditions, deck ledger connections shall be designed in accordance with Section R301.

R507.2.1 Ledger details. Deck ledgers installed in accordance with Section R507.2 shall be a minimum 2-inch by 8-inch (51 mm by 203 mm) nominal, pressure-preservative treated southern pine, incised pressure-preservative-treated Hem-fir, or approved, naturally durable, No. 2 grade or better lumber. Deck ledgers installed in accordance with Section R507.2 shall not support concentrated loads from beams or girders. Deck ledgers shall not be supported on stone or masonry veneer.

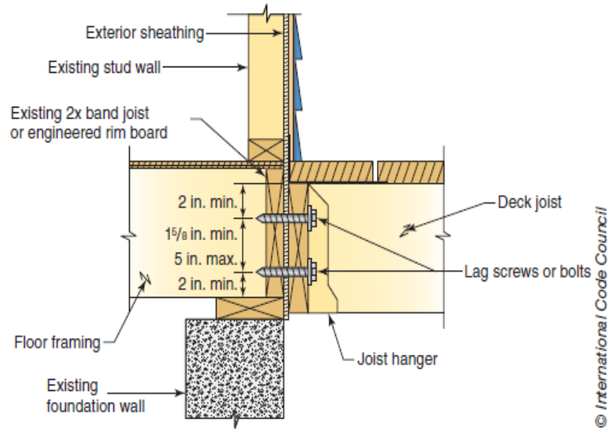
R507.2.2 Band joist details. Band joists attached by a ledger in accordance with Section R507.2 shall be a minimum 2-inch-nominal (51 mm), solid-sawn, spruce-pine-fir lumber or a minimum 1-inch by 91/2-inch (25 mm □ 241 mm) dimensional, Douglas fir, laminated veneer lumber. Band joists attached by a ledger in accordance with Section R507.2 shall be fully supported by a wall or sill plate below.

R507.2.3 Ledger to band joist fastener details. Fasteners used in deck ledger connections in accordance with Table R507.2 shall be hot-dipped galvanized or stainless steel and shall be installed in accordance with Table R507.2.1 and Figures R507.2.1(1) and R507.2.1(2).

R507.2.4 Deck lateral load connection. The lateral load connection required by Section R507.1 shall be permitted to be in accordance with Figure R507.2.3(1) or R507.2.3(2). Where the lateral load connection is provided in accordance with Figure R507.2.3(1), hold-down tension devices shall be installed in not less than two locations per deck, within 24 inches of each end of the deck. Each device shall have an allowable stress design capacity of

City of Houston Amendment

Analysis: The deck ledger section is reorganized and expanded with new language to better describe the minimum requirements for connection of deck ledgers to band joists.



Deck ledger connection to band joist

Change Significance: Section R507.2 addressing the prescriptive method for connecting a deck ledger to the band joist (rim board) has been reorganized to clarify the requirements. Redundant language has been removed, prescriptive options have been moved from the table footnotes to the section text, and language describing the approved materials has been revised to provide consistency. The 2015 IRC Section R507.2 adds the IRC-defined term "naturally durable lumber" to the materials allowed for a deck ledger connection using the prescriptive provisions. In the 2012 IRC, the description of allowable species for ledger material was not consistent between the section text, the table title, and the table footnotes. Section R507.2 referred to decay-resistant properties of pressure-preservative-treated pine or hem-fir,

	not less than 1,500 pounds (6,672 N). Where the lateral load connections are provided in accordance with Figure R507.2.3(2), the hold-down tension devices shall be installed in not less than four locations per deck, and each device shall have an allowable stress design capacity of not less than 750 pounds (3,336 N). **R507.3 Plastic composite deck boards, stair treads, guards, or handrails.** Plastic composite exterior deck boards, stair treads, guards and handrails shall comply with the requirements of ASTM D 7032 and the requirements of Section 507.3. **TABLE R507.2** ~~Fastener Spacing for a Southern Pine or Hem-fir Deck Ledger and A 2-Inch Nominal Solid-Sawn Spruce-pine-fir Band Joist[c, f, g]~~ Deck Ledger Connection to Band Joist[a, b] (Deck live load = 40 psf, deck dead load = 10 psf, snow load ≤ 40 psf) Joist Span Connection Details: 6′ and less | 6′1″ to 8′ | 8′1″ to 10′ | 10′1″ to 12′ | 12′1″ to 14′ | 14′1″ to 16′ | 16′1″ to 18′ On-center spacing of fasteners[d, e] ½ inch diameter lag screw with ~~15/32~~ ½ inch maximum sheathing [c, d]: 30 | 23 | 18 | 15 | 13 | 11 | 10 ½ inch diameter bolt with ~~15/32~~ ½ inch maximum sheathing[d]: 36 | 36 | 34 | 29 | 24 | 21 | 19 ½ inch diameter bolt with ~~15/32~~ 1 inch maximum sheathing ~~and ½ inch washers~~[b, e]: 36 | 36 | 29 | 24 | 21 | 18 | 16 For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm. 1 pound per square foot = 0.0479 kPa. a. Ledgers shall be flashed in accordance with Section R703.8 to prevent water from contacting the house band joist. b. Snow load shall not be assumed to act concurrently with live load. c. The tip of the lag screw shall fully extend beyond the inside face of the band joist. d. Sheathing shall be wood structural panel or solid sawn lumber. e. Sheathing shall be permitted to be wood structural panel, gypsum board, fiberboard, lumber, or foam sheathing. Up to ½-inch thickness of stacked washers shall be permitted to substitute for up to ½ inch of allowable sheathing thickness when combined with wood structural panel or lumber sheathing. ~~The maximum gap between the face of the ledger board and face of the wall sheathing shall be ½ inch.~~ ~~b. Lag screws and bolts shall be staggered in accordance with Section R507.2.1~~ ~~c. Deck ledger shall be minimum 2 × 8 pressure preservative treated No. 2 grade lumber, or other approved materials as established by standard engineering practice.~~ ~~d. When solid sawn pressure preservative treated deck ledgers are attached to a minimum 1 inch thick engineered wood product (structural composite lumber, laminated veneer lumber or wood structural panel band joist), the ledger attachment shall be designed in accordance with accepted engineering practice.~~ ~~f. A minimum 1 × 9 ½ Douglas Fir laminated veneer lumber rim board shall be permitted in lieu of the 2 inch nominal band joist.~~	*and then continued with a reference to "approved decay-resistant species," leaving it to the building official to decide whether pine and hem-fir were approved. The heading of Table R507.2, however, referred only to pine and hem-fir and not the use of decay-resistant species. Lastly, table footnotes e and f referenced use of any pressure-preservative-treated, #2 grade lumber species or use of engineered lumber.* *The 2012 IRC text required a nominal 2-inch band joist in Table R507.2. Although code users recognized that 2 inches was intended as a minimum dimension, thicker band joists were not specifically addressed. In the 2015 IRC, the term "minimum" is moved in front of the size description. The sheathing thickness of 15/32 inch is updated to ½ inch to accommodate the thickness of common foam plastic sheathing.* *Table R507.2 first appeared in the 2009 IRC to provide an easy-to follow prescriptive means for attaching a deck to a dwelling. Other methods may still be used, and often are, to provide equivalent connection capacities, if the method is approved by the building official. For example, proprietary fasteners are commonly installed following the manufacturer's instructions and based on equivalent capacities. Testing to develop the prescriptive method in Table R507.2 was performed with three configurations:* *1. ½ inch lag screw with 15/32-inch OSB between the ledger and the band joist* *2. ½ inch bolt with 15/32-inch OSB between the ledger and the band joist* *3. ½ inch bolt with ½ inch stack of washers and 15/32-inch OSB between the ledger and the band joist* *These three cases correspond to the three rows of the ledger table. Based on testing, for the first two configurations, the ledger, OSB, and band joist must be in direct contact with one another. For the third configuration, an additional gap filled by the washers is permitted between the ledger and the band joist. Minor changes have occurred to the table in the past two code cycles.* *Note that the terms "band joist" and "rim board" are used synonymously and are interchangeable in this significant change and throughout the book.* **Justification:** This Table has been updated based on research conducted by the AWC and the National Forestry data in the IRC 2015 Edition.
N/A	**R507.5 Deck joists.** Maximum allowable spans for wood deck joists, as shown in Figure R507.5, shall be in accordance with Table R507.5. Deck joists shall be permitted to cantilever a maximum of one-fourth of the actual, adjacent joist span. **R507.5.1 Lateral restraint at supports.** Joist ends and bearing locations shall be provided with lateral restraint to prevent rotation. Where lateral restraint is provided by joist hangers or blocking between joists, their depth shall equal not less than 60 percent of the joist depth. Where lateral restraint is provided by rim joists, they shall be secured to the end of each joist with not less than (3) 10d (3 inch by 0.128 inch) (76 mm by 3 mm) nails or (3) No. 10 by 3 inch (76 mm) long wood screws.	***City of Houston Amendment*** **Analysis:** New sections and tables added to the IRC provide prescriptive methods for joists and beams in deck construction. Section R507.5 describes requirements for deck joists, Section R507.6 lists requirements for deck beams, and Section R507.7 describes minimum bearing requirements for joists and beams.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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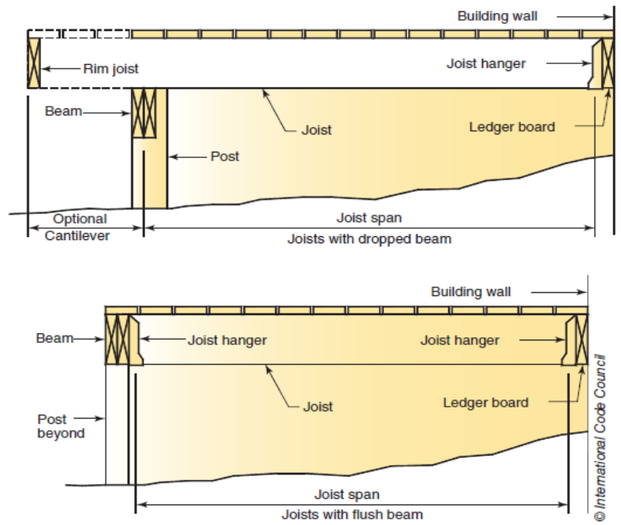
TABLE R507.5 Deck Joist Spans for Common Lumber Species[f] (ft.-in.)

Species[a]	Size	Spacing of Deck Joists With No Cantilever[b] (inches)			Spacing of Deck Joists With Cantilevers[c] (inches)		
		12	16	24	12	16	24
Southern pine	2 × 6	9-11	9-0	7-7	6-8	6-8	6-8
	2 × 8	13-1	11-10	9-8	10-1	10-1	9-8
	2 × 10	16-2	14-0	11-5	14-6	14-0	11-5
	2 × 12	18-0	16-6	13-6	18-0	16-6	13-6
Douglas fir-larch[d], hem-fir[d] spruce-pine-fir[d]	2 × 6	9-6	8-8	7-2	6-3	6-3	6-3
	2 × 8	12-6	11-1	9-1	9-5	9-5	9-1
	2 × 10	15-8	13-7	11-1	13-7	13-7	11-1
	2 × 12	18-0	15-9	12-10	18-0	15-9	12-10
Redwood, western cedars, ponderosa pine[e], red pine[e]	2 × 6	8-10	8-0	7-0	5-7	5-7	5-7
	2 × 8	11-8	10-7	8-8	8-6	8-6	8-6
	2 × 10	14-11	13-0	10-7	12-3	12-3	10-7
	2 × 12	17-5	15-1	12-4	16-5	15-1	12

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

a. No. 2 grade with wet service factor.
b. Ground snow load, live load = 40 psf, dead load = 10 psf, L/Δ = 360.
c. Ground snow load, live load = 40 psf, dead load = 10 psf, L/Δ = 360 at main span, L/Δ = 180 at cantilever with a 220-pound point load applied to end.
d. Includes incising factor.
e. Northern species with no incising factor
f. Cantilevered spans not exceeding the nominal depth of the joist are permitted.

R507.6 Deck Beams. Maximum allowable spans for wood deck beams, as shown in Figure R507.6, shall be in accordance with Table R507.6. Beam plies shall be fastened with two rows of 10d (3 inch by 0.128 inch) (76 mm by 3 mm) nails minimum at 16 inches (406 mm) on center along each edge. Beams shall be permitted to cantilever at each end up to one-fourth of the actual beam span. Splices of multi-span beams shall be located at interior post locations.



Typical deck joist spans

Change Significance: The 2015 IRC includes additional details for decks to provide prescriptive methods for conventional wood deck construction. There are many construction methods that have long been in practice and are widely accepted. Designers and builders have used available information for determining joist and beam spans, as well as support and connection details. The new information and span tables in the code reflect a desire by many code users for more prescriptive guidance specific to decks.

Deck support provisions now describe maximum joist and beam spans, minimum connections between beams and posts, and minimum bearing length. New span tables specifically for decks are introduced. The span tables addressing joist and beam length are not based on the existing tables in IRC Chapters 5 and 6. Spans are shorter than listed in the current floor joist tables. The deck tables assume use of the joists in outdoor, potentially wet, conditions.

The new tables are based on wood capacity using the National Design Specification for Wood Construction (NDS). Additional wood species have also been included, such as Redwood, western cedar, ponderosa pine and red pine, that are not included in the existing joist and beam span tables. The deck joist and beam tables assume #2 grade wood, wet use, and incising, when applicable. Incising is done to assist chemical additives to soak deeper into preservative-treated lumber. Incising is only assumed in lumber species that are preservative treated, such as Douglas Fir and Hemlock Fir, and resistant to pressure treatment. Southern Pine more easily absorbs preservatives during the pressure-treating process and does not require incising.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
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	TABLE R507.6 Deck Beam Span Lengths[a,b] (ft.-in.)	

Species[c]	Size[d]	Deck Joist Span Less Than or Equal to: (feet) 6	8	10	12	14	16	18
Southern pine	2 – 2 × 6	6-11	5-11	5-4	4-10	4-6	4-3	4-0
	2 – 2 × 8	8-9	7-7	6-9	6-2	5-9	5-4	5-0
	2 – 2 × 10	10-4	9-0	8-0	7-4	6-9	6-4	6-0
	2 – 2 × 12	12-2	10-7	9-5	8-7	8-0	7-6	7-0
	3 – 2 × 6	8-2	7-5	6-8	6-1	5-8	5-3	5-0
	3 – 2 × 8	10-10	9-6	8-6	7-9	7-2	6-8	6-4
	3 – 2 × 10	13-0	11-3	10-0	9-2	8-6	7-11	7-6
	3 – 2 × 12	15-3	13-3	11-10	10-9	10-0	9-4	8-10
Douglas fir-larch[e], hem-fir[e], spruce-pine-fir[e], redwood, western cedars, ponderosa pine[f], red pine[f]	3 × 6 or 2 – 2 × 6	5-5	4-8	4-2	3-10	3-6	3-1	2-9
	3 × 8 or 2 – 2 × 8	6-10	5-11	5-4	4-10	4-6	4-1	3-8
	3 × 10 or 2 – 2 × 10	8-4	7-3	6-6	5-11	5-6	5-1	4-8
	3 × 12 or 2 – 2 × 12	9-8	8-5	7-6	6-10	6-4	5-11	5-7
	4 × 6	6-5	5-6	4-11	4-6	4-2	3-11	3-8
	4 × 8	8-5	7-3	6-6	5-11	5-6	5-2	4-10
	4 × 10	9-11	8-7	7-8	7-0	6-6	6-1	5-8
	4 × 12	11-5	9-11	8-10	8-1	7-6	7-0	6-7
	3 – 2 × 6	7-4	6-8	6-0	5-6	5-1	4-9	4-6
	3 – 2 × 8	9-8	8-6	7-7	6-11	6-5	6-0	5-8
	3 – 2 × 10	12-0	10-5	9-4	8-6	7-10	7-4	6-11
	3 – 2 × 12	13- 11	12-1	10-9	9-10	9-1	8-6	8-1

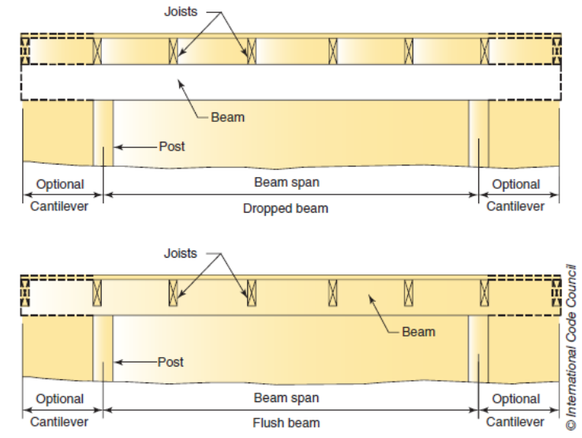
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

a. Ground snow load, live load = 40 psf, dead load = 10 psf, L/Δ = 360 at main span, L/Δ = 180 at cantilever with a 220-pound point load applied at the end.
b. Beams supporting deck joists from one side only.
c. No 2 grade, wet service factor.
d. Beam depth shall be greater than or equal to depth of joists with a flush beam condition.
e. Includes incising factor.
f. Northern species. Incising factor not included.

R507.7 Deck joist and deck beam bearing. The ends of each joist and beam shall have not less than 1½ inches (38 mm) of bearing on wood or metal and not less than 3 inches (76 mm) on concrete or masonry for the entire width of the beam. Joist framing into the side of a ledger board or beam shall be supported by approved joist hangers. Joists bearing on a beam shall be connected to the beam to resist lateral displacement.

R507.7.1 Deck post to deck beam. Deck beams shall be attached to deck posts in accordance with Figure R507.8.7.1 or by other equivalent means capable of resisting lateral displacement. Manufactured post-to-beam connectors shall be sized for the post and beam sizes. All bolts shall have washers under the head and nut.

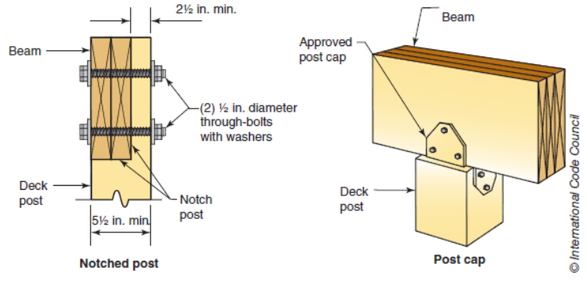
Exception: Where deck beams bear directly on footings in accordance with Section R507.8.1.



Typical deck beam spans

In addition to the new span tables, the code now addresses connection details between beams and posts specific to deck construction. The connection details illustrated in Figure R507.7.1 offer two options. The first requires support by a notched post with two ½-inch-diameter through-bolts with washers. The notch must provide 3 inches of bearing for the width of the beam with a minimum 2½ inches of the post remaining for the through-bolt connection. This type of connection will require a minimum nominal 4 3 6 post to provide the necessary 5½-inch cross section.

The second option for beam-to-post connection is a manufactured connector commonly called a "post cap." The connector must be approved by the building official and must be sized for the post and beam sizes. Other equivalent connection details are also acceptable. Bearing requirements for deck beams and joists in Section R507.7 are consistent with bearing requirements in Section R502.6 of the IRC.



Connection of deck posts to deck beam

Justification: This Table has been updated based on AWC and the National Forestry data in the IRC 2015 Edition.

N/A	**R507.8 Deck posts.** For single-level, wood-framed decks with beams sized in accordance with Table R507.6, deck post size shall be in accordance with Table R507.8.	***City of Houston Amendment*** **Analysis:** New sections and tables added to the IRC provide prescriptive methods for joists and beams in deck construction. Section R507.5 describes requirements for deck joists, Section R507.6 lists requirements for deck beams, and Section R507.7 describes minimum bearing requirements for joists and beams.

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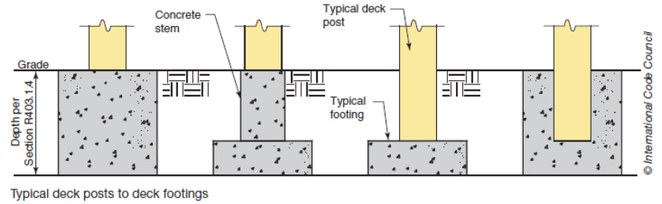
	TABLE R507.8 Deck Post Height[a] For SI: 1 foot = 304.8 mm a. Measured to the underside of the beam. **R507.8.1 Deck post to deck footing.** Posts shall bear on footings in accordance with Section R403 and Figure R507.8.1. Posts shall be restrained to prevent lateral displacement at the bottom support. Such lateral restraint shall be provided by manufactured connectors installed in accordance with Section R507 and the manufacturers' instructions or a minimum post embedment of 12 inches (305 mm) in surrounding soils or concrete piers.	*Change Significance:* *As part of a more detailed prescriptive deck design option, the 2015 IRC adds provisions for sizing wood posts and connecting posts to the foundation for a deck. The post-sizing provisions are presented in tabular form. Depending on the height of the post, the code permits nominal 4 X 4, 4 X 6, and 6 X 6 wood posts. In practice, nominal 6 3 6 posts are most used. The code does not prescribe the species or grade for deck posts. Section R317 addresses protection of wood against decay. A minimum post-to-footing connection is required to provide lateral restraint and prevent lateral displacement. The code requires manufactured connectors to be installed in accordance with the manufacturer's requirements when less than 12 inches of footing embedment exists.* **Justification:** This Table has been updated based on AWC and the National Forestry data in the IRC 2015 Edition.

2012 Houston IRC – Chapter 6 Wall Construction	2015 Houston IRC – Chapter 6 Wall Construction	Code Analysis
TABLE R602.3(1) **FASTENER SCHEDULE FOR STRUCTURAL MEMBERS**	**TABLE R602.3(1)** **FASTENER SCHEDULE**	***City of Houston Amendment*** **Analysis:** The Fastening Schedule now contains multiple nail size options. Clarification of roof rafter connections at ridge, valley, and hip is added. *CHANGE SIGNIFICANCE:* *IRC Table R602.3(1), wood frame nailing schedule, is reformatted to give typical nailing options to make the table consistent with 2015 IBC Table 2304.10.1. The change states minimum size and number of fasteners for each connection. Changes in both the IBC and IRC tables create increased consistency of minimum nailing requirements for wood frame construction. Nailing requirements are clarified using the exact dimensions of commonly used power-driven, box and common nail sizes in the table.* *In many cases, the IRC minimum nailing for roofs remains unchanged except for addition of IBC nailing options. For instance, the base nailing of the following remains unchanged: Item 6, Rafter, or roof truss to plate; Item 7, Roof rafters to ridge, valley, or hip rafters. In other cases, there is an increase in the number of smaller-diameter nails by 1 nail to maintain a minimum connection of approximately equal strength to that provided by IBC nailing requirements.* *Nailing values are based on normal load duration and calculated assuming framing with a minimum Specific Gravity of 0.42, for example, using Spruce-Pine-Fir (SPF). However, some minimum nailing requirements are recommended as good practice and are not associated with a standard minimum load or calculation basis.* *An item for ceiling joists attached to parallel rafters has been added to point the user to the minimum nailing requirements located in Chapter 8. Rafter-to-ridge-beam connections are also added to the fastener schedule.* **Justification:** This Table has been updated based on AWC and the National Forestry data in the IRC 2015 Edition.
	TABLE R602.3(1) **FASTENER SCHEDULE**	***City of Houston Amendment*** **Analysis:** The Fastening Schedule for Structural Members now contains multiple nail size options. Clarification of double top plate splicing is added. Descriptions are updated in the IRC and the International Building Code (IBC) for attachments in walls as well.

TABLE R602.3(1) Fastening Schedule ~~for Structural Members~~

Item	Description of Building Elements	Number and Type of Fastener[a, b, c]	Spacing and Location ~~of Fasteners~~
	Roof		
1	Blocking between ceiling joists or rafters to top plate~~, toe nail~~	~~3-8d~~ 4-8d box (2½″ × 0.113″); or 3-8d common (2½″ × 0.131″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails	Toe nail
2	Ceiling joists to top plate~~, toe nail~~	~~3-8d~~ 4-8d box (2½″ × 0.113″); or 3-8d common (2½″ × 0.131″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails	Per joist, toe nail
3	Ceiling joist not attached to parallel rafter, laps over partitions~~, face nail~~ [See Sections R802.3.1, R802.3.2, Table R802.5.1(9)]	~~3-10d~~ 4-10d box (3″ × 0.128″); or 3-16d common (3½″ × 0.162″); or 4-3″ × 0.131″ nails	Face nail
4	Ceiling joist attached to parallel rafter (heel joint) [See Sections R802.3.1, R802.3.2, Table R802.5.1(9)]	Per Table R802.5.1(9)	Face nail
5	Collar tie to rafter, face nail or 1¼″ × 20 gage ridge strap to rafter	~~3-10d~~ 4-10d box (3″ × 0.128″); or 3-10d common (3″ × 0.148″); or 4-3″ × 0.131″ nails	Face nail each rafter
6	Rafter or roof truss to plate~~, toe nail~~	3-16d box nails (3½″ × 0.135″); or 3-10d common nails (3″ × 0.148″); or 4-10d box (3″ × 0.128″); or 4-3″ × 0.131 nails	2 toe nails on one side and 1 toe nail on opposite side of each rafter or truss[i]
7	Roof rafters to ridge, valley or hip rafters or roof rafter to minimum 2″ ridge beam~~, toe nail face nail~~	4-16d box (3½″ × 0.135″); or 3-10d common (3½″ × 0.148″); or 4-10d box (3″ × 0.128″); or 4-3″ × 0.131″ nails	Toe nail
		3-16d box (3½″ × 0.135″) 2-16d common (3½″ × 0.162″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails	End nail

(Footnotes not shown for brevity and clarity.)



Typical deck posts to deck footings

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

COLOR CODE INDEX: Turquoise = NEW or Modified Text by ICC in 2015; ~~Yellow Strike through~~ = Text Deleted from the Code by COH; Text Underlined = COH Amendment added (NEW); Green Text = NEW or Modified Text by COH in 2015; Grey Text = Previous COH Amendment Brought Forward to 2015; ~~Strike through~~ = Text Deleted from the Code by ICC

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER[a, b, c]	SPACING OF FASTENERS
	Roof		
1	Blocking between joists or rafters to top plate, toe nail	3-8d ($2^1/_2$″ × 0.113″)	—
2	Ceiling joists to plate, toe nail	3-8d ($2^1/_2$″ × 0.113″)	—
3	Ceiling joists not attached to parallel rafter, laps over partitions, face nail	3-10d	—
4	Collar tie to rafter, face nail or $1^1/_4$″ × 20 gage ridge strap	3-10d (3″ × 0.128″)	—
5	Rafter or roof truss to plate, toe nail	3-16d box nails ($3^1/_2$″ × 0.135″) or 3-10d common nails (3″ × 0.148″)	2 toe nails on one side and 1 toe nail on opposite side of each rafter or truss[j]
6	Roof rafters to ridge, valley or hip rafters: toe nail face nail	4-16d ($3^1/_2$″ × 0.135″) 3-16d ($3^1/_2$″ × 0.135″)	—
	Wall		
7	Built-up studs-face nail	10d (3″ × 0.128″)	24″o.c.
8	Abutting studs at intersecting wall corners, face nail	16d (3 ½″ × 0.135″)	12″o.c.
9	Built-up header, two pieces with $^1/_2$″spacer	16d ($3^1/_2$″ × 0.135″)	16″o.c. along each edge
10	Continued header, two pieces	16d ($3^1/_2$″ × 0.135″)	16″o.c. along each edge
11	Continuous header to stud, toe nail	4-8d ($2^1/_2$″ × 0.113″)	—
12	Double studs, face nail	10d (3″ × 0.128″)	24″o.c.
13	Double top plates, face nail	10d (3″ × 0.128″)	24″o.c.
14	Double top plates, minimum 24-inch offset of end joints, face nail in lapped area	8-16d ($3^1/_2$″ × 0.135″)	—
15	Sole plate to joist or blocking, face nail	16d ($3^1/_2$″ × 0.135″)	16″o.c.
16	Sole plate to joist or blocking at braced wall panels	3-16d ($3^1/_2$″ × 0.135″)	16″o.c.
17	Stud to sole plate, toe nail	3-8d ($2^1/_2$″ × 0.113″) or 2-16d ($3^1/_2$″ × 0.135″)	—
18	Top or sole plate to stud, end nail	2-16d ($3^1/_2$″ × 0.135″)	—
19	Top plates, laps at corners and intersections, face nail	2-10d (3″ × 0.128″)	—
20	1″brace to each stud and plate, face nail	2-8d ($2^1/_2$″ × 0.113″) 2 staples $1^3/_4$″	— —
21	1″ × 6″sheathing to each bearing, face nail	2-8d ($2^1/_2$″ × 0.113″) 2 staples $1^3/_4$″	— —
22	1″ × 8″sheathing to each bearing, face nail	2-8d ($2^1/_2$″ × 0.113″) 3 staples $1^3/_4$″	— —
23	Wider than 1″ × 8″sheathing to each bearing, face nail	3-8d ($2^1/_2$″ × 0.113″) 4 staples $1^3/_4$″	— —
	Floor		
24	Joist to sill or girder, toe nail	3-8d ($2^1/_2$″ × 0.113″)	—
25	Rim joist to top plate, toe nail (roof applications also)	8d ($2^1/_2$″ × 0.113″)	6″o.c.
26	Rim joist or blocking to sill plate, toe nail	8d (2 ½″ × 0.113″)	6″o.c.
27	1″ × 6″subfloor or less to each joist, face nail	2-8d ($2^1/_2$″ × 0.113″) 2 staples $1^3/_4$″	— —
28	2″subfloor to joist or girder, blind and face nail	2-16d ($3^1/_2$″ × 0.135″)	—
29	2″planks (plank & beam - floor & roof)	2-16d ($3^1/_2$″ × 0.135″)	at each bearing
30	Built-up girders and beams, 2-inch lumber layers	10d (3″ × 0.128″)	Nail each layer as follows: 32″o.c. at top and bottom and staggered. Two nails at ends and at each splice.
31	Ledger strip supporting joists or rafters	3-16d ($3^1/_2$″ × 0.135″)	At each joist or rafter

(continued)

TABLE R602.3(1) Fastening Schedule ~~for Structural Members~~

Item	Description of Building Elements	Number and Type of Fastener[a, b, c]	Spacing ~~of Fasteners~~ and Location
	Wall		
8	Stud to stud (not at braced wall panels) ~~Built-up studs - face nail~~	~~10d (3″ × 0.128″)~~ 16d common (3½″ × 0.162″) 10d box (3″ × 0.128″); or 3″ × 0.131″ nails	24″ o.c. face nail 16″ o.c. face nail
9	Stud to stud and abutting studs at intersecting wall corners (at braced wall panels) ~~, face nail~~	16d box (3½″ × 0.135″); or 3″ × 0.131″ nails 16d common (3½″ × 0.162″)	12″ o.c. face nail 16″ o.c. face nail
10	Built-up header ~~, two pieces with~~ (2″ to 2″ header with ½″ spacer)	~~16d (3½″ × 0.135″)~~ 16d common (3½″ × 0.162″) 16d box (3½″ × 0.135″)	16″ o.c. each edge face nail 12″ o.c. each edge face nail
11	Continuous header to stud ~~, toe nail~~	~~4-8d~~ 5-8d box (2½″ × 0.113″); or 4-8d common (2½″ × 0.131″); or 4-10d box (3″ × 0.128″)	Toe nail
12	Top plate to top plate ~~Double top plates, face nail~~	~~10d (3″ × 0.128″)~~ 16d common (3½″ × 0.162″) 10d box (3″ × 0.128″); or 3″ × 0.131″ nails	~~24″ o.c.~~ 16″ o.c. face nail 12″ o.c. face nail
13	Double top plate splice for SDCs A-D_2 with seismic braced wall line spacing < 25′ Double top plate splice SDCs D_0, D_1 or D_2; and braced wall line spacing ≥ 25′	~~8-16d (3-½″ × 0.135″)~~ 8-16d common (3½″ × 0.162″); or 12-16d box (3½″ × 0.135″); or 12-10d box (3″ × 0.128″); or 12-3″ × 0.131″ nails 12-16d (3-½″ × 0.135″)	Face nail on each side of end joint (minimum 24″ lap splice length each side of end joint)
14	Bottom plate to joist, rim joist, band joist or blocking (not at braced wall panels) ~~Sole plate to joist or blocking, face nail~~	~~16d (3½″ × 0.135″)~~ 16d common (3½″ × 0.162″) 16d box (3½″ × 0.135″); or 3″ × 0.131″ nails	16″ o.c. face nail 12″ o.c. face nail
15	~~Sole plate to~~ Bottom plate to joist, rim joist, band joist, or blocking (at braced wall panel) ~~, face nail~~	3-16d box (3½″ × 0.135″); or 2-16d common (3½″ × 0.162″); or 4-3″ × 0.131″ nails	3 each 16″ o.c. face nail 2 each 16″ o.c. face nail 4 each 16″ o.c. face nail
16	Top or bottom plate to stud ~~Stud to sole plate, toe nail~~	~~3-8d~~ 4-8d box (2½″ × 0.113″);or ~~3-16d~~ 3-16d box (3½″ × 0.135″); or 4-8d common (2½″ × 0.131″); or 4-10d box (3″ × 0.128″); or 4-3″ × 0.131″ nails ~~2-16d~~ 3-16d box (3½″ × 0.135″); or 2-16d common (3½″ × 0.162″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails	Toe nail End nail
17	Top plates, laps at corners and intersections ~~, face nail~~	~~2-10d~~ 3-10d box (3″ × 0.128″); or 2-16d common (3½″ × 0.162″); or 3-3″ × 0.131″ nails	Face nail
18	1″ brace to each stud and plate ~~, face nail~~	~~2-8d~~ 3-8d box (2½″ × 0.113″); or 2-8d common (2½″ × 0.131″); or 2-10d box (3″ × 0.128″); or 2 staples 1¾″	Face nail
19	1″ × 6″ sheathing to each bearing ~~, face nail~~	~~2-8d~~ 3-8d box (2½″ × 0.113″); or 2-8d common (2½″ × 0.131″); or 2-10d box (3″ × 0.128″); or 2 staples ~~1¾″~~; 1″ crown, 16 ga., 1¾″ long	Face nail
20	1″ × 8″ and wider sheathing to each bearing ~~, face nail~~ Wider than 1″ × 8″	~~2-8d~~ 3-8d box (2½″ × 0.113″); or 3-8d common (2½″ × 0.131″); or 3-10d box (3″ × 0.128″); or 3 staples ~~1¾″~~; 1″ crown, 16 ga., 1¾″ long ~~3-8d~~ 4-8d box (2½″ × 0.113″); or 3-8d common (2½″ × 0.131″); or 3-10d box (3″ × 0.128″); or 4 staples ~~1¾″~~; 1″ crown, 16 ga., 1¾″ long	Face nail Face nail

(Footnotes not shown for brevity and clarity.)

CHANGE SIGNIFICANCE: IRC Table R602.3(1), wood frame nailing schedule, is reformatted to give typical nailing options and to make the table consistent with 2015 IBC Table 2304.10.1. The change states the minimum size and number of fasteners for each connection. Changes in both the IBC and IRC tables create increased consistency of minimum nailing requirements for wood frame construction. Nailing requirements are clarified using the exact dimensions of commonly used power-driven, box and common nail sizes in the table. In many cases, the IRC minimum nailing requirements remain unchanged except for addition of IBC nailing options. For instance, base nailing of the following remains unchanged: Item 9, Stud to stud and abutting studs at intersecting wall corners (at braced wall panels); and Item 15, Bottom plate to joist, rim joist, band joist, or blocking (at braced wall panel).

In other cases, there is an increase in the number of smaller nails by 1 to maintain a minimum connection of approximately equal strength to that provided by IBC nailing. Nailing values are based on normal load duration and calculated assuming framing with Specific Gravity equal to 0.42, for example, using Spruce-Pine-Fir (SPF). However, some minimum nailing requirements are recommended as good practice and are not associated with a standard minimum load or calculation basis.

Low resistance of IRC minimum nailing relative to applied loads occurs with connection details such as bottom plate to joist and top plate to top plate, particularly where loads are based on upper IRC limits (for example, wind pressures associated with 140 mph Exposure B and 10-foot stud heights). In many cases, the increased strength of IBC minimum fastening provides a better match to loads than the 2012 IRC fastening schedule.

In previous editions, the IRC had two requirements for double top plate splices. In 2012 IRC Table R602.3(1), Item 14, the requirement for a double top plate splice was a minimum 24 inches offset at the splice between the top and bottom plates, attached with (8) 16d nails. This conflicted with the requirement in Table R602.10.3(4), footnote c. The footnote required use of (12) 16d nails on each side of the splice. To correct the conflict, former Item 14 of R602.3(1) is divided into two separate line items, to differentiate the appropriate number of nails. In addition, language now indicates that fasteners are required on each side of the splice location. A corresponding change for footnote c of Table R602.10.3(4) refers the user back to Table R602.3(1) for splice-plate attachment guidance.

Justification: This Table has been updated based on AWC and the National Forestry data in the IRC 2015 Edition.

R611.1 General. Exterior concrete walls shall be designed and constructed in accordance with the provisions of this section or in accordance with the provisions of PCA 100 or ACI 318. ~~When PCA 100, ACI 318 or the provisions of this section are used to design concrete walls, project drawings, typical details and specifications are not required to bear the seal of the architect or engineer responsible for design, unless otherwise required by the state law of the jurisdiction having authority.~~	**R608.1 General.** Exterior concrete walls shall be designed and constructed in accordance with the provisions of this section or in accordance with the provisions of PCA 100 or ACI 318. ~~Where PCA 100, ACI 318 or the provisions of this section are used to design concrete walls, project drawings, typical details and specifications are not required to bear the seal of the architect or engineer responsible for design, unless otherwise required by the state law of the *jurisdiction* having authority.~~	***City of Houston Amendment*** **Analysis:** Amendment moved from 2012 Section R611.1 to this section. ***No change to the previous technical code requirements or code intent of this section.*** **Justification:** This amendment is necessary to ensure that applicable drawings contain the appropriate seals of the architects or engineers responsible for their design. The amendment was previously located in R611.1.
R613.1 General. Structural insulated panel (SIP) walls shall be designed in accordance with the provisions of this section. ~~When the provisions of this section are used to design structural insulated panel walls, project drawings, typical details and specifications are not required to bear the seal of the~~	**R610.1 General.** Structural insulated panel (SIP) walls shall be designed in accordance with the provisions of this section. ~~Where the provisions of this section are used to design structural insulated panel walls, project drawings, typical details and specifications are not required to bear the seal of the~~	***City of Houston Amendment*** **Analysis:** Amendment moved from 2012 Section R613.1 to this section. ***No change to the previous technical code requirements or code intent of this section.***

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
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~~architect or engineer responsible for design, unless otherwise required by the state law of the jurisdiction having authority.~~	~~architect or engineer responsible for design, unless otherwise required by the state law of the *jurisdiction having authority.*~~	**Justification:** This amendment is necessary to ensure that applicable drawings contain the appropriate seals of the architects or engineers responsible for their design. The amendment was previously located in R613.1.
R613.7 Drilling and notching. The maximum vertical chase penetration in SIPs shall have a maximum side dimension of 2 inches (51 mm) centered in the panel core. Vertical chases shall have a minimum spacing of 24-inches (610 mm) on center. Maximum of two horizontal chases shall be permitted in each wall panel, one at 14 inches (360 mm) from the bottom of the panel and one at mid-height of the wall panel. The maximum allowable penetration size in a wall panel shall be circular or rectangular with a maximum dimension of 12 inches (305 mm). Overcutting of holes in facing panels shall not be permitted.	**R610.7 Drilling and Notching**. The maximum vertical chase penetration in SIPs shall have a maximum side dimension of 2 inches (51 mm) centered in the panel. Vertical chases shall have a minimum spacing of 24 inches (610 mm) on center. Maximum of two horizontal chases shall be permitted in each wall panel—one at 14 inches (360 mm) plus or minus 2 inches (51 mm) from the bottom of the panel and one at mid-height of the wall panel core at 48 inches (1220 mm) plus or minus 2 inches (51 mm) from the bottom edge of the SIPs panel. The maximum allowable penetration size in a wall panel shall be as shown on the manufacturer's shop drawings circular or rectangular with a maximum dimension of 12 inches (300 mm). Overcutting of holes in facing panels shall not be permitted. Additional penetrations are permitted where justified by analysis.  Holes made onsite in structural insulated panels	***City of Houston Amendment*** **Analysis:** Drilling and notching provisions for structural insulated panels (SIP) are clarified with this prescriptive addition to the model code. *CHANGE SIGNIFICANCE: The wording of Section R613.7 in the 2012 IRC was based on an 8-foot-tall structural insulated panel (SIP). As Section R613 permitted up to 10-foot-tall walls, the horizontal chases, which are used for switchbox wiring, need to be placed 48 inches above the bottom edge of the SIP, which is standard switch-box height. A chase in SIP construction is a drilled hole or slot through which cables are run, typically for electrical connections. Chases may be created by the manufacturer or drilled onsite.* *In 2015 IRC Section R610.7, a tolerance is added to the dimension for ease of use in the field. Requirements for manufacturers' shop drawings showing holes have been deleted. Prescriptive maximum size and location are now the only requirements for vertical and horizontal chases. Any additional holes or chases require engineered design.* **Justification:** This amendment is necessary to ensure that applicable drawings contain the appropriate seals of the architects or engineers responsible for their design. The amendment was previously located in R613.1.
2012 Houston IRC – Chapter 7 Wall Coverings	**2015 Houston IRC – Chapter 7 Wall Coverings**	**Code Analysis**
SECTION R703 **EXTERIOR COVERING** **R703.3 Wood, hardboard, and wood structural panel siding.** **R703.3.1 Panel siding.** Joints in wood, hardboard or wood structural panel siding shall be made as follows unless otherwise approved. Vertical joints in panel siding shall occur over framing members, unless wood or wood structural panel sheathing is used, and shall be ship-lapped or covered with a batten. Horizontal joints in panel siding shall be lapped a minimum of 1 inch (25 mm) or shall be ship-lapped or shall be flashed with Z-flashing and occur over solid blocking, wood, or wood structural panel sheathing. **R703.3.2 Horizontal siding.** Horizontal lap siding shall be installed in accordance with the manufacturer's recommendations. Where there are no recommendations, the siding shall be lapped a minimum of 1 inch (25 mm), or 1/2 inch (13 mm) if rabbeted, and shall have the ends caulked, covered with a batten, or sealed and installed over a strip of flashing.	**SECTION R703** **EXTERIOR COVERING** **R703.3 Nominal thickness and attachments.** The nominal thickness and attachment of exterior wall coverings shall be in accordance with Table R703.3(1), the wall covering material requirements of this section, and the wall covering manufacturer's installation instructions. Cladding attachment over foam sheathing shall comply with the additional requirements and limitations of Sections R703.15 through R703.17. Nominal material thicknesses in Table R703.3(1) are based on a maximum stud spacing of 16 inches (406 mm) on center. Where specified by the siding manufacturer's instructions and supported by a test report or other documentation, attachment to studs with greater spacing is permitted. Fasteners for exterior wall coverings attached to wood framing shall be in accordance with Section R703.3.2 and Table R703.3(1). Exterior wall coverings shall be attached to cold-formed steel light frame construction in accordance with the cladding manufacturer's installation instructions, the requirements of Table R703.3(1) using screw fasteners substituted for the nails specified in accordance with Table R703.3(2), or an approved design.	***City of Houston Amendment*** **Analysis:** Table R703.4, Weather Resistant Siding Attachment and Minimum Thickness, is simplified. New code language and Tables are added to Section R703 to clarify limitations of use of the tables and to describe fastener type, length, and penetration. *CHANGE SIGNIFICANCE: The 2012 IRC Table R703.4 is replaced with a simplified table, and former footnotes and column text are added to the provisions relating to siding attachment.* *Section R703.3 covers nominal thickness and attachment of siding. Attachment is based on 16-inch on center stud spacing. Table R703.3(1) is referenced for nail specifications, which have been reformatted to match Table R602.3(1). Minimum fastener size and penetration requirements, along with other installation details, are in Table R703.3(1) (former Table R703.4) and mirror current installation guides. The water-resistive barrier required column is deleted. All products in Table R703.3(1) require a water-resistive barrier. Exceptions remain in Section R703.2 for detached accessory buildings and certain paper-backed stucco lath products.* *Section R703.3.1 references Table R301.2(2) for required component and cladding loads given the dwelling's location. New language requires design wind pressures to be determined using an effective wind area of 10 square feet. For wall cladding, the effective wind area will be governed by the effective wind area of an individual fastener, which is less than 10 square feet.* *Table R703.3.1 has been added to simplify the determination of whether the prescriptive fastening provisions of Table R703.3(1) apply to a specific building. Fasteners are limited to a maximum design pressure of 30 psf. The limits in the table indicate where component and cladding pressures exceed 30*

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R703.3.1 Wind limitations. Where the design wind pressure exceeds 30 psf or where the limits of Table R703.3.1 are exceeded, the attachment of wall coverings shall be designed to resist the component and cladding loads specified in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3). For the determination of wall covering attachment, component and cladding loads shall be determined using an effective wind area of 10 square feet (0.93 m^2).

TABLE R703.3.1 Limits for Attachment per Table R703.3(1)

Ultimate Wind Speed (mph, 3-second gust)	Maximum Mean Roof Height		
	Exposure		
	B	C	D
115	NL	50′	20′
120	NL	30′	DR
130	60′	15′	DR
140	35′	DR	DR

For SI: 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s
NL = not limited by Table R703.3.1, DR = Design Required

R703.3.2 Fasteners. Exterior wall coverings shall be securely fastened with aluminum, galvanized, stainless steel, or rust-preventative coated nails or staples in accordance with Table R703.3(1) or with other approved corrosion-resistant fasteners in accordance with the wall covering manufacturer's installation instructions. Nails and staples shall comply with ASTM F1667. Nails shall be T-head, modified round head, or round head with smooth or deformed shanks. Staples shall have a minimum crown width of 7/16-inch (11.1 mm) outside diameter and be manufactured of minimum 16 gage wire. Where fiberboard, gypsum, or foam plastic sheathing backing is used, nails or staples shall be driven into the studs. Where wood or wood structural panel sheathing is used, fasteners shall be driven into studs unless otherwise permitted to be driven into sheathing in accordance with either the siding manufacturer's installation instructions or Table R703.3.2.

psf as a function of wind speed exposure and mean roof height. In most cases, especially in areas with lower wind speeds, the prescriptive fastening requirements in Table R703.3(1) will be applicable.

According to Table R301.2(2), for Zone 5 and an effective wind area of 10 square feet, the maximum negative pressure for an ultimate design wind speed of 140 mph is 28.0 psf (this is approximately equal to the old 110-mph basic wind speed). This value—less than 30 psf—correlates directly with the 140-mph limitation in Table R703.3.1. However, the tabulated pressures in Table R301.2(2) are for an assumed Wind Exposure B site condition and a mean roof height of 30 feet. For residential buildings with an ultimate design wind speed of 140 mph and Exposure C or D, or a mean roof height greater than 30 feet, the maximum negative pressure is higher than 30 psf.

Although mean roof heights of 50 feet and 60 feet are listed in the table as upper limits for the wind pressure, the IRC limit of three stories above-grade plane (R102.1) still applies. Chapter 7 of ICC 600 includes prescriptive attachment schedules for exterior wall coverings that may be applied when mean roof height limits per Table R703.5 are exceeded.

FEMA P-499, Home Builder's Guide to Coastal Construction (FEMA, 2009), includes Technical Fact Sheet 5.3, which addresses the attachment of siding in areas where wind loads for wall cladding exceed 30 psf because of wind speed, exposure category, or roof mean height by recommending selection of a siding product rated for those conditions. The manufacturer's product literature or installation instructions should specify fastener type, size and spacing, and any other installation details such as requirements for sheathing materials behind vinyl siding that are needed to achieve the product rating.

Section R703.3.2, a new subsection, describes minimum fastener requirements by combining 2012 IRC Table R703.4 footnotes b, c, d, g, and r. The section requires all nails and staples to comply with ASTM F1667. The 2012 IRC Table R703.4 footnotes i and j move to former Section R703.3, now Section R703.5, describing wood, hardboard, and wood structural panel siding. New subsections have been added to describe the specific requirements relevant to horizontal wood siding, vertical wood siding, and panel siding products.

Section R703.3.3, a new subsection, details fastener length and penetration. The penetration requirements from 2012 IRC Table R703.4 footnotes m and o for hardboard siding and footnotes v, y, and z are in this new section. The shank and head diameters in footnotes m and o for hardboard siding are moved into the main table, Table R703.3(1).

The 2012 IRC Table R703.4 footnotes q and s on fiber-cement are now located in their respective material listings. The 2012 IRC Table R703.4 footnote w reference to TMS 402 is now in the adhered veneer section, Section R703.12.

Insulated vinyl siding installation practices are updated, including several requirements placed in Table R703.3(1). Installation specifications are very similar to those for vinyl siding, including a minimum thickness requirement from ASTM D7793, a water-resistive barrier, nail penetration depth and size, fastener spacing, and provisions for installation over foam sheathing.

Justification: Code clarification simplifies the code provisions of this section.

TABLE R703.3.2 Optional Siding Attachment Schedule for Fasteners Where No Stud Penetration Necessary

Application	Number and type of Fastener	Spacing of Fasteners[b]
Exterior wall covering (weighing 3 psf or less) attachment to wood structural panel sheathing, either direct or over foam sheathing a maximum of 2 inches thick.[a]	Ring shank roofing nail (0.120″ min. dia.)	12″ o.c.
	Ring shank nail (0.148″ min. dia.)	15″ o.c.
Note: Does not apply to vertical siding.	No. 6 screw (0.138″ min. dia.)	12″ o.c.
	No. 8 screw (0.164″ min. dia.)	16″ o.c.

a. Fastener length shall be sufficient to penetrate back side of the wood structural panel sheathing by at least ¼ inch. The wood structural panel sheathing shall be not less than $^{7}/_{16}$ inch in thickness.
b. Spacing of fasteners is per 12 inches of siding width. For other siding widths, multiply spacing of fasteners above by a factor of 12/s, where s is the siding width in inches. Fastener spacing shall never be greater than the manufacturer's minimum recommendations.

TABLE R703.3(2) Screw Fastener Substitution for Siding Attachment to Cold-Formed Steel Light Frame Construction[a,b,c,d,e]

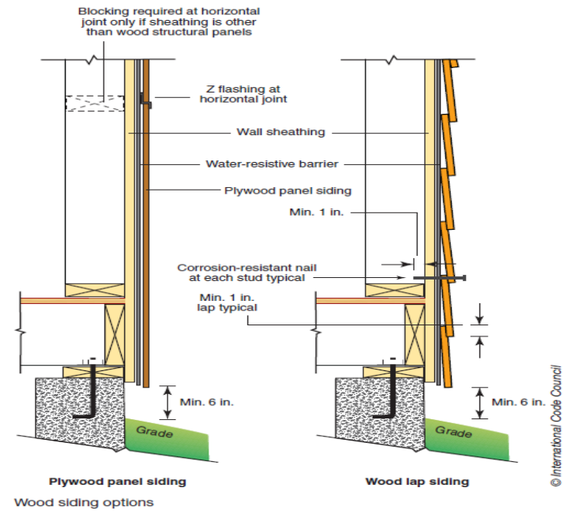
Nail Diameter per Table R703.3(1)	Minimum Screw Fastener Size
0.099″	No. 6
0.113″	No. 7
0.120″	No. 8

For SI: 1 inch = 25.4 mm

a. Screws shall comply with ASTM C1513 and shall penetrate a minimum of three threads through minimum 33 mil (20 gauge) cold-formed steel frame construction.
b. Screw head diameter shall not be less than the nail head diameter required by Table R703.3(1).
c. Number and spacing of screw fasteners shall comply with Table R703.3(1).
d. Pan head, hex washer head, modified truss head, or other screw head types with a flat attachment surface under the head shall be used for vinyl siding attachment.
e. Aluminum siding shall not be fastened directly to cold-formed steel light frame construction.

R703.3.3 Minimum fastener length and penetration. Fasteners shall have the greater of the minimum length specified in Table R703.3(1) or as required to provide a minimum penetration into framing as follows:

1. Fasteners for horizontal aluminum siding, steel siding, particleboard panel siding, wood structural panel siding in accordance with ANSI/APA-PRP 210, fiber-cement panel siding, and fiber-cement lap siding installed over foam plastic sheathing shall penetrate not less than 11/2 inches (38 mm) into framing or shall be in accordance with the manufacturer's installation instructions.
2. Fasteners for hardboard panel and lap siding shall penetrate not less than 11/2 inches (38 mm) into framing.
3. Fasteners for vinyl siding and insulated vinyl siding installed over wood or wood structural panel sheathing shall penetrate not less than 11/4 inches (32 mm) into sheathing and framing combined. Vinyl siding and insulated vinyl siding shall be permitted to be installed with fasteners penetrating

	into or through wood or wood structural sheathing of minimum thickness as specified by the manufacturer's instructions or test report, with or without penetration into the framing. Where the fastener penetrates fully through the sheathing, the end of the fastener shall extend not less than 1/4 inch (6.4 mm) beyond the opposite face of the sheathing. Fasteners for vinyl siding and insulated vinyl siding installed over foam plastic sheathing shall be in accordance with Section R703.11.2. Fasteners for vinyl siding and insulated vinyl siding installed over fiberboard or gypsum sheathing shall penetrate not less than 11/4 inches (32 mm) into framing. **4.** Fasteners for vertical or horizontal wood siding shall penetrate not less than 11/2 inches (38 mm) into studs, studs and wood sheathing combined, or blocking. **5.** Fasteners for siding material installed over foam plastic sheathing shall have sufficient length to accommodate foam plastic sheathing thickness and to penetrate framing or sheathing and framing combined, as specified in Items 1 through 4.	
R703.5 Wood shakes and shingles. Wood shakes and shingles shall conform to CSSB *Grading Rules for Wood Shakes and Shingles.* **R703.5.1 Application.** Wood shakes or shingles shall be applied either single-course or double-course over nominal 1/2-inch (13 mm) wood-based sheathing or to furring strips over 1/2-inch (13 mm) nominal nonwood sheathing. A permeable water-resistive barrier shall be provided over all sheathing, with horizontal overlaps in the membrane of not less than 2 inches (51 mm) and vertical overlaps of not less than 6 inches (152 mm). Where furring strips are used, they shall be 1 inch by 3 inches or 1 inch by 4 inches (25 mm by 76 mm or 25 mm by 102 mm) and shall be fastened horizontally to the studs with 7d or 8d box nails and shall be spaced a distance on center equal to the actual weather exposure of the shakes or shingles, not to exceed the maximum exposure specified in Table R703.5.2. The spacing between adjacent shingles to allow for expansion shall not exceed 1/4 inch (6 mm), and between adjacent shakes, it shall not exceed ½-inch (13 mm). The offset spacing between joints in adjacent courses shall be a minimum of 1 ½-inches (38 mm). **R703.5.2 Weather exposure.** The maximum weather exposure for shakes and shingles shall not exceed that specified in Table R703.5.2.	**R703.5 Wood, Hardboard, and Wood Structural Panel Siding.** Wood, hardboard, and wood structural panel siding shall be installed in accordance with this section and Table R703.3(1). Hardboard siding shall comply with CPA/ANSI A135.6. Hardboard siding used as architectural trim shall comply with CPA/ANSI A 135.7. **R703.5.1 Vertical Wood Siding.** Wood siding applied vertically shall be nailed to horizontal nailing strips or blocking set not more than 24 inches (610 mm) on center. **R703.5.2 Panel Siding.** 3/8-inch (9.5 mm) wood structural panel siding shall not be applied directly to studs spaced more than 16 inches (406 mm) on center where the long dimension is parallel to studs. Wood structural panel siding 7/16-inch (11.1 mm) or thinner shall not be applied directly to studs spaced more than 24 inches (610 mm) on center. The stud spacing shall not exceed the panel span rating provided by the manufacturer unless the panels are installed with the face grain perpendicular to the studs or over sheathing approved for that stud spacing. Joints in wood, hardboard, or wood structural panel siding shall be made as follows unless otherwise approved. Vertical joints in panel siding shall occur over framing members, unless wood or wood structural panel sheathing is used, and shall be ship-lapped or covered with a batten. Horizontal joints in panel siding shall be lapped not less than 1-inch (25 mm) or shall be ship-lapped or flashed with Z-flashing and occur over solid blocking, wood, or wood structural panel sheathing. **R703.5.3 Horizontal Wood Siding.** Horizontal lap siding shall be installed in accordance with the manufacturer's recommendations. Where there are no recommendations, the siding shall be lapped not less than 1-inch (25 mm), or ½-inch (13 mm) if rabbeted, and shall have the ends caulked, covered with a batten, or sealed and installed over a strip of flashing.	***City of Houston Amendment*** **Analysis:** ***Modification –*** Minimum spacing based on siding thickness has been moved from 2012 IRC Table R703.4 footnote i, siding attachment and minimum thickness, to 2015 IRC Section R703.5.2, panel siding. Requirements for vertical wood siding have moved from 2012 IRC footnote j to 2015 IRC Section R703.5.1, vertical wood siding.  Wood siding options *CHANGE SIGNIFICANCE: The 2012 IRC Table 703.4 footnotes i and j moved to Section 703.5 describing wood, hardboard, and wood structural panel siding. New subsections describe the specific requirements for stud spacing and minimum siding lap relevant to horizontal wood siding, vertical wood siding, and panel siding products. Minimum fastener size and penetration requirements, along with other installation details, are in Table R703.3(1), former Table R703.4, and mirror current Western Wood Products Association (WWPA) and Western Red Cedar Lumber Association (WRCLA) installation guides.* **Justification:** Approved through the ANSI process at the national code development hearings.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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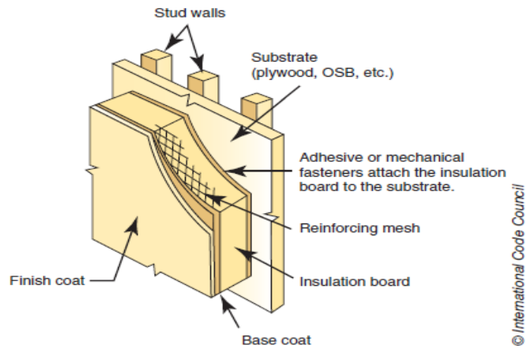
R703.6 Exterior plaster. Installation of these materials shall be in compliance with ASTM C 926 and ASTM C 1063 and the provisions of this code.	**R703.7 Exterior plaster.** Installation of these materials shall be in compliance with ASTM C 926, ASTM C 1063 and the provisions of this code. **Exception:** Lath may be continuous behind *control joints.*	***City of Houston Amendment*** **Analysis:** This section in the model code was renumbered due to new code sections being added to Chapter 7. COH amendment was added to reflect standard industry practice for inspection and application clarity. ***No change to the previous technical code requirements or code intent of this section.*** **Justification:** Legal has added this amendment per 10-12-2021 blackline file.
R703.9 Exterior insulation and finish system (EIFS)/EIFS with drainage. Exterior Insulation and Finish System (EIFS) shall comply with this chapter and Sections R703.9.1 and R703.9.3. EIFS with drainage shall comply with this chapter and Sections R703.9.2, R703.9.3 and R703.9.4.	**R703.9 Exterior Insulation and Finish Systems (EIFS)** **R703.9 Exterior Insulation and Finish System (EIFS)/ EIFS with Drainage.** Exterior Insulation and Finish Systems (EIFS) shall comply with this chapter and Sections R703.9.1. EIFS with drainage shall comply with this chapter and Sections R703.9.2. **R703.9.1 Exterior Insulation and Finish Systems (EIFS).** EIFS shall comply with the following: **1.** ASTM E2568. **2.** EIFS shall be limited to applications over concrete or masonry wall assemblies (substrates). **3.** Flashing of EIFS shall be provided in accordance with the requirements of Section R703.8. **4.** EIFS shall be installed in accordance with the manufacturer's installation instructions. **5.** EIFS shall terminate not less than 6 inches (152 mm) above the finished ground level. **6.** Decorative trim shall not be face-nailed through the EIFS. **R703.9.2 Exterior Insulation and Finish System (EIFS) with Drainage.** EIFS with drainage shall comply with the following: **1.** ASTM E2568. **2.** EIFS with drainage shall be required over all wall assemblies with the exception of concrete and masonry wall assemblies. **3.** EIFS with drainage shall have an average minimum drainage efficiency of 90 percent when tested in accordance with ASTM E 2273. **4.** The water-resistive barrier shall comply with Section R703.2 or ASTM E 2570. **5.** The water-resistive barrier shall be applied between the EIFS and the wall sheathing. **6.** Flashing of EIFS with drainage shall be provided in accordance with the requirements of Section R703.8. **7.** EIFS with drainage shall be installed in accordance with the manufacturer's installation instructions. **8.** EIFS with drainage shall terminate not less than 6 inches (152 mm) above the finished ground level. **9.** Decorative trim shall not be face nailed through the EIFS with drainage.	***City of Houston Amendment*** **Analysis:** ***Modification*** – Limitations for exterior insulation and finish systems with and without drainage have been added to the 2015 IRC.  EIFS composition *CHANGE SIGNIFICANCE: When the EIFS section was added to the IRC in the 2009 edition, it was industry's position that EIFS (also known as "barrier" EIFS or EIFS without drainage) would be limited to applications over concrete or masonry substrates. It was also the intent that EIFS with drainage would be required on light-framed walls constructed under the IRC. These applications are consistent with the ICC Evaluation Service Reports for the products.* *In the 2012 IRC this intent was unclear. For example, in Section 703.1.1, Exception 2 allows an "opt-out" for the need for a means of drainage in the exterior wall envelope if it can meet the requirements of ASTM E331. Thus, although an EIFS "barrier" system could meet this requirement, the industry did not recommend this application on residential light-framed construction* *The 2015 IRC section on EIFS clarifies the use of EIFS. EIFS without drainage may be used in concrete and masonry wall construction. For light-frame construction, EIFS with drainage must be used. Reference to specific standards is added or clarified to assist the designer and builder in selecting the correct type of EIFS.* **Justification:** Approved through the ANSI process at the national code development hearings.:
R703.11 Vinyl siding. Vinyl siding shall be certified and *labeled* as conforming to the requirements of ASTM D 3679 by an *approved* quality control agency. **R703.11.1 Installation.** Vinyl siding, soffit and accessories shall be installed in accordance with the manufacturer's installation instructions.	**R703.11 Vinyl siding.** Vinyl siding shall be certified and *labeled* as conforming to the requirements of ASTM D 3679 by an *approved* quality control agency. **R703.11.1 Installation.** Vinyl siding, soffit and accessories shall be installed in accordance with the manufacturer's instructions. **R703.11.1.1 Fasteners.** Unless specified otherwise by the manufacturer's instructions, fasteners for vinyl siding shall be 0.120-inch (3 mm) shank	***City of Houston Amendment*** **Analysis:** ***New additions*** - This code section includes new changes that clarifies nailing penetration and spacing requirements for horizontal and vertical vinyl siding. *CHANGE SIGNIFICANCE: In the 2012 IRC, information on vinyl siding fastener specifications, penetration, and spacing was found only in Table R703.4 and its footnotes. This code change places the requirements into the text of the code provision where they are easily located and more clearly stated. Vinyl siding can be used in conjunction with a variety of sheathing types, some of which contribute to*

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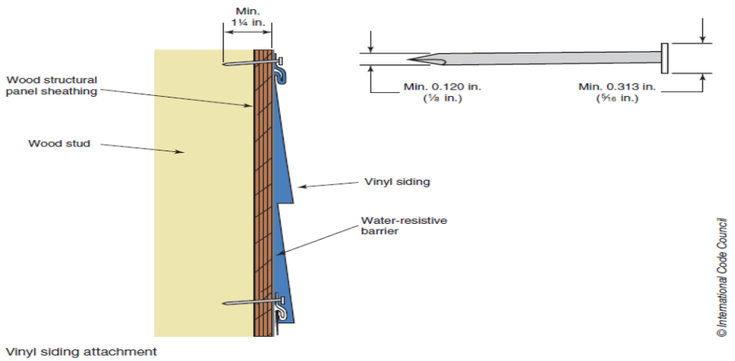
 Vinyl siding attachment	diameter nail with a 0.313-inch (8 mm) head or 16-gage staple with a 3/8-inch (9.5 mm) to 1/2-inch (12.7 mm) crown. **R703.11.1.2 Penetration depth.** Unless specified otherwise by the manufacturer's instructions, fasteners shall penetrate into building framing. The total penetration into sheathing, furring framing or other nailable substrate shall be a minimum 11/4 inches (32 mm). Where specified by the manufacturer's instructions and supported by a test report, fasteners are permitted to penetrate into or fully through nailable sheathing or other nailable substrate of minimum thickness specified by the instructions or test report without penetrating into framing. Where the fastener penetrates fully through the sheathing, the end of the fastener shall extend a minimum of 1/4 inch (6.4 mm) beyond the opposite face of the sheathing or nailable substrate. **R703.11.1.3 Spacing.** Unless specified otherwise by the manufacturer's instructions, the maximum spacing between fasteners for horizontal siding shall be 16 inches (406 mm), and for vertical siding 12 inches (305 mm) both horizontally and vertically. Where specified by the manufacturer's instructions and supported by a test report, greater fastener spacing is permitted. ~~R703.11.1.1~~ **R703.11.1.4 Vinyl Soffit Panels.** Soffit panels shall be individually fastened to a supporting component such as a nailing strip, fascia or subfascia component or as specified by the manufacturer's instructions.	*resisting fastener withdrawal. It is necessary to ensure that, regardless of the sheathing type, the total penetration into a material capable of holding fasteners is equivalent to what was used during testing of the siding. For typical siding installations, this is ¾-inch penetration into framing plus approximately ½ inch through wood sheathing, for a total of 1¼ inches of penetration into "nailable" material. This minimum penetration is required unless a different penetration is specified in the manufacturer's instructions. A definition of "nailable substrate" is added to define what is considered to be "nailable."* *Where the siding is used over a non-nailable material the total penetration must still be achieved, in this case by using a fastener long enough to accommodate the thickness of non-nailable material and penetrate the full 1¼ inches into framing or a combination of framing and other nailable material. By stating the requirement in terms of the total required penetration, it is clear what penetration is needed for all installations.* *In addition, the maximum fastener spacing for both horizontal and vertical siding has been added to the code text. The IRC previously had no provision for fastener spacing for vertical siding, the new requirement mirrors provisions in the IBC.* **Justification:** Approved through the ANSI process at the national code development hearings.**:**
R703.11 Vinyl siding. Vinyl siding shall be certified and *labeled* as conforming to the requirements of ASTM D 3679 by an *approved* quality control agency. **R703.11.1 Installation.** Vinyl siding, soffit and accessories shall be installed in accordance with the manufacturer's installation instructions. **R703.11.1.1 Vinyl soffit panels.** Soffit panels shall be individually fastened to a supporting component such as a nailing strip, fascia or subfascia component or as specified by the manufacturer's instructions. **R703.11.2 Foam plastic sheathing.** Vinyl siding used with foam plastic sheathing shall be installed in accordance with Section R703.11.2.1, R703.11.2.2, or R703.11.2.3. **Exception:** Where the foam plastic sheathing is applied directly over wood structural panels, fiberboard, gypsum sheathing or other *approved* backing capable of independently resisting the design wind pressure, the vinyl siding shall be installed in accordance with Section R703.11.1. **R703.11.2.1 Basic wind speed not exceeding 90 miles per hour and Exposure Category B.** Where the basic wind speed does not exceed 90 miles per hour (40 m/s), the Exposure Category is B and gypsum wall board or equivalent is installed on the side of the wall opposite the foam plastic sheathing, the minimum siding fastener penetration into wood framing shall be 1 1/4-inches (32 mm) using minimum 0.120-inch diameter nail (shank) with a minimum 0.313-inch diameter head, 16 inches on center. The foam plastic sheathing shall be minimum 1/2-inch-thick (12.7 mm) (nominal) extruded polystyrene per ASTM C 578, 1/2-inch-thick (12.7	**R703.13 Insulated Vinyl Siding.** Insulated vinyl siding shall be certified and labeled as conforming to the requirements of ASTM D 7793 by an approved quality control agency. **703.13.1 Insulated Vinyl Siding and Accessories.** Insulated vinyl siding and accessories shall be installed in accordance with manufacturer's installation instructions. **R703.14 Polypropylene Siding.** Polypropylene siding shall be certified and labeled as conforming to the requirements of ASTM D7254 by an approved quality control agency. **R703.14.1 Polypropylene Siding and Accessories.** Polypropylene siding and accessories shall be installed in accordance with manufacturer's installation instructions. **R703.14.1.1 Installation.** Polypropylene siding shall be installed over and attached to wood structural panel sheathing with minimum thickness of 7/16-inch (11.1 mm), or other substrate, composed of wood or wood-based material and fasteners having equivalent withdrawal resistance. **R703.14.1.2 Fastener Requirements.** Unless otherwise specified in the approved manufacturer's instructions, nails shall be corrosion resistant, with a minimum 0.120-inch (3 mm) shank and minimum 0.313-inch (8 mm) head diameter. Nails shall be a minimum of 1 ¼-inches (32 mm) long or as necessary to fully penetrate sheathing or substrate not less than 3/4 inch (19.1 mm). Where the nail fully penetrates the sheathing or nailable substrate, the end of the fastener shall extend not less than ¼-inch (6.4	***City of Houston Amendment*** **Analysis:** ***New additions*** set minimum requirements for insulated vinyl siding and polypropylene siding provide minimum installation standards based on ASTM D7793 Insulated Vinyl Siding.

mm) (nominal) polyisocyanurate per ASTM C 1289, or 1- inch-thick (25 mm) (nominal) expanded polystyrene per ASTM C 578.

R703.11.2.2 Basic wind speed exceeding 90 miles per hour or Exposure Categories C and D. Where the basic wind speed exceeds 90 miles per hour (40 m/s) or the Exposure Category is C or D, or all conditions of Section R703.11.2.1 are not met, the adjusted design pressure rating for the assembly shall meet or exceed the loads listed in Tables R301.2(2) adjusted for height and exposure using Table R301.2(3). The design wind pressure rating of the vinyl siding for installation over solid sheathing as provided in the vinyl siding manufacturer's product specifications shall be adjusted for the following wall assembly conditions:

1. For wall assemblies with foam plastic sheathing on the exterior side and gypsum wall board or equivalent on the interior side of the wall, the vinyl siding's design wind pressure rating shall be multiplied by 0.39.
2. For wall assemblies with foam plastic sheathing on the exterior side and no gypsum wall board or equivalent on the interior side of wall, the vinyl siding's design wind pressure rating shall be multiplied by 0.27.

R703.11.2.3 Manufacturer specification. Where the vinyl siding manufacturer's product specifications provide an *approved* design wind pressure rating for installation over foam plastic sheathing, use of this design wind pressure rating shall be permitted and the siding shall be installed in accordance with the manufacturer's installation instructions.

mm) beyond the opposite face of the sheathing or substrate. Staples are not permitted.

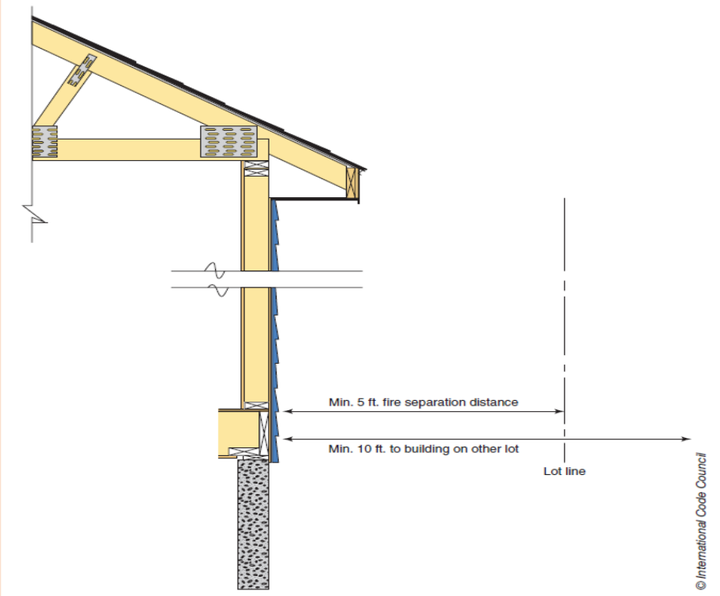
R703.14.2 Fire Separation. Polypropylene siding shall not be installed on walls with a fire separation distance of less than 5 feet (1,524 mm) and walls closer than 10 feet (3,048 mm) to a building on another lot.

Exception: Walls perpendicular to the line used to determine the fire separation distance.

SECTION R202
DEFINITIONS

Insulated Vinyl Siding. A vinyl cladding product with manufacturer installed foam plastic insulating material as an integral part of the cladding product, having a minimum thermal resistance of not less than R-2.

Polypropylene Siding. A shaped material, made principally from polypropylene homopolymer, or copolymer, that in some cases contains fillers or reinforcements, that is used to clad exterior walls or buildings.



Minimum fire separation distance for polypropylene siding

CHANGE SIGNIFICANCE: New Section R703.13, Insulated Vinyl Siding, sets requirements based on the current ASTM standard for insulated vinyl siding, ASTM D7793. Insulated vinyl siding is certified to an ASTM standard by an approved third-party inspection agency. Performance requirements are specified by the ASTM standard, ensuring that insulated vinyl siding can meet minimum requirements as a cladding insulation. Insulated vinyl siding is vinyl siding with rigid foam insulation laminated or permanently attached to the panel.

This change provides a method for building officials to verify that insulated vinyl siding is code compliant. In energy codes and energy efficiency programs, insulated siding is recognized as a form of "continuous insulation," or insulation installed on the exterior of the building that helps reduce energy loss through framing or other building material. The insulated siding provides a supplemental rain screen that reduces the amount of water reaching the underlying water-resistive barrier. With a properly applied water-resistive barrier, insulated siding minimizes moisture penetration from the exterior into a wall assembly and provides a way for moisture to readily drain and dry. The presence of a layer of thermal insulation filling the space between insulated siding and wall sheathing also aids in moisture management.

Section R703.14, Polypropylene Siding, sets minimum performance requirements for polypropylene siding and requires a third-party inspection agency to verify compliance with an internationally accepted ASTM standard. Additionally, appropriate installation and use of polypropylene siding are detailed. Use of polypropylene siding is limited to walls with a fire separation distance of 5 feet or more and walls 10 feet or more from a building on another lot.

Justification: Approved through the ANSI process at the national code development hearings.:

N/A

R703.15 Cladding Attachment over Foam Sheathing to Wood Framing. Cladding shall be specified and installed in accordance with Section R703, the cladding manufacturer's approved installation instructions, including any limitations for use over foam plastic sheathing, or an approved design. In addition, the cladding or furring attachments through foam sheathing to framing shall meet or exceed the minimum fastening requirements of Section R703.15.1, Section R703.15.2, or an approved design for support of cladding weight.

City of Houston Amendment

Analysis: ***New additions*** - Three new RIC 2015 Sections R703.15, .16, and .17 now set minimum requirements for cladding attachment over foam sheathing to wood framing (R703.15), cold-formed steel framing (R703.16), and masonry or concrete walls (R703.17). For light-frame construction, prescriptive requirements are given. Connection to concrete and masonry construction continues to require engineered design in most cases when placing foam over the concrete or masonry wall.

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Exceptions:

1. Where the cladding manufacturer has provided approved installation instructions for application over foam sheathing, those requirements shall apply.
2. For exterior insulation and finish systems, refer to Section R703.9.
3. For anchored masonry or stone veneer installed over foam sheathing; refer to Section R703.7.

R703.15.1 Direct Attachment. Where cladding is installed directly over foam sheathing without the use of furring, cladding minimum fastening requirements to support the cladding weight shall be as specified in Table R703.15.1.

R703.15.2 Furred Cladding Attachment. Where wood furring is used to attach cladding over foam sheathing, furring minimum fastening requirements to support the cladding weight shall be as specified in Table R703.15.2. Where placed horizontally, wood furring shall be preservative treated wood in accordance with Section R317.1 or naturally durable wood and fasteners shall be corrosion resistant in accordance with Section R317.3.

R703.17 Cladding Attachment over Foam Sheathing to Masonry or Concrete Wall Construction. Cladding shall be specified and installed in accordance with Section 703.3 and the cladding manufacturer's installation instructions or an approved design. Foam sheathing shall be attached to masonry or concrete construction in accordance with the insulation manufacturer's installation instructions or an approved design. Furring and furring attachments through foam sheathing into concrete or masonry substrate shall be designed to resist design loads determined in accordance with Section R301, including support of cladding weight as applicable. Fasteners used to attach cladding or furring through foam sheathing to masonry or concrete substrates shall be approved for application into masonry or concrete material and shall be installed in accordance with the fastener manufacturer's installation instructions.

Exceptions:

1. Where the cladding manufacturer has provided approved installation instructions for application over foam sheathing and connection to a masonry or concrete substrate, those requirements shall apply.
2. For exterior insulation and finish systems, refer to Section R703.9.
3. For anchored masonry or stone veneer installed over foam sheathing, refer to Section R703.7.

TABLE R703.15.1 Cladding Minimum Fastening Requirements for Direct Attachment over Foam Plastic Sheathing to Support Cladding Weight[a]

TABLE R703.15.2 Furring Minimum Fastening Requirements for Application over Foam Plastic Sheathing to Support Cladding Weight[a,b]

CHANGE SIGNIFICANCE: Section R703.15 provides attachment provisions for exterior wall covering assemblies that include foam plastic insulation and are applied to wood framing members. Section R703.16 provides attachment provisions for exterior wall covering assemblies that include foam plastic insulation applied to cold-formed steel studs with wood or steel sheathing. Section R703.17 contains provisions for cladding attachment over foam sheathing to concrete or masonry walls.

The new sections provide requirements for attachment of furring over foam sheathing to resist wind loading—an application that was not addressed previously in the IRC. During high winds, failures have repeatedly occurred of cladding attached over foam sheathing to gable end walls and first- and second-story walls. To reduce failures of the sheathing attachment, prescriptive connections that consider foam sheathing have been added to the IRC.

Calculations were completed to determine the wall cladding resistance to wind forces. In the first application, furring was assumed to be placed beneath the cladding and over the foam sheathing to improve siding durability. In the second, cladding is placed directly over foam sheathing with attachments passing through the foam and embedding in wood or cold-formed steel framing. The wind pressure limits are based on the weaker capacity of either fastener withdrawal or furring bending strength, where applicable. From these calculations, minimum attachment requirements are calculated. These attachment calculations include a maximum thickness of foam sheathing.

Sections R703.15 and R703.16 for light-frame construction give prescriptive fastening requirements for cladding materials installed over foam sheathing to ensure adequate performance. The proposed cladding attachment requirements and foam sheathing thickness limits are based on calculations verified by test data to control cladding connection movement to no more than 0.015-inch slip under cladding weight or dead load.

A prescriptive solution for attachment of cladding to masonry or concrete walls through foam sheathing has not been added to the IRC. Prescriptive "off-the-shelf" solutions with standardized types of concrete or masonry fasteners have not been developed. In fact, many fasteners best suited for this application are proprietary and engineered design is required. Section R703.17 requires engineering analysis of cladding connections through foam sheathing to masonry or concrete. As an exception, this engineered design may be done by the manufacturer with an approved prescriptive solution supplied in an evaluation report or installation instructions to the builder.

Justification: Approved through the ANSI process at the national code development hearings.:

2012 Houston IRC – Chapter 8 Roof-Ceiling Construction	2015 Houston IRC – Chapter 8 Roof-Ceiling Construction	Code Analysis

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

COLOR CODE INDEX: **Turquoise** = NEW or Modified Text by ICC in 2015 | **Yellow Strike through** = Text Deleted from the Code by COH | **Text Underlined** = COH Amendment added (NEW) | **Green Text** = NEW or Modified Text by COH in 2015 | **Grey Text** = Previous COH Amendment Brought Forward to 2015 | **Strike through** = Text Deleted from the Code by ICC

Tables R802.4, R802.5 Ceiling Joist and Rafter Tables

Tables R802.4, R802.5 Ceiling Joist and Rafter Tables

TABLE R802.4(1) Ceiling Joist Spans for Common Lumber Species (Uninhabitable attics without storage, live load = 10 psf, L/Δ = 240)

Ceiling Joist Spacing (inches)	Species and Grade		Dead Load = 5 psf 2 × 4 Maximum ceiling joist spans (feet - inches)	2 × 6 (feet - inches)	2 × 8 (feet - inches)	2 × 10 (feet - inches)
16	Douglas fir-larch	SS	11-11	18-9	24-8	Note a
	Douglas fir-larch	#1	11-6	18-1	23-10	Note a
	Douglas fir-larch	#2	11-3	17-8	23-4	Note a
	Douglas fir-larch	#3	9-7	14-1	17-10	21-9
	Hem-fir	SS	11-3	17-8	23-4	Note a
	Hem-fir	#1	11-0	17-4	22-10	Note a
	Hem-fir	#2	10-6	16-6	21-9	Note a
	Hem-fir	#3	9-5	13-9	17-5	21-3
	Southern pine	SS	11-9	18-5	24-3	Note a
	Southern pine	#1	11-3	17-8	23-10	Note a
	Southern pine	#2	10-9	16-11	21-7	25-7
	Southern pine	#3	8-9	12-11	16-3	19-9
	Spruce-pine-fir	SS	11-0	17-4	22-10	Note a
	Spruce-pine-fir	#1	10-9	16-11	22-4	Note a
	Spruce-pine-fir	#2	10-9	16-11	22-4	Note a
	Spruce-pine-fir	#3	9-5	13-9	17-5	21-3

(Portions of table not shown for brevity and clarity.)

City of Houston Amendment

Analysis: ***Modification*** – Changes to Southern Pine, Douglas Fir-Larch, and Hemlock Fir capacities have reduced the maximum spans for lumber in the ceiling joist and rafter span tables of the International Residential Code. These changes have been linked to the changes in harvesting tree in the forestry industry. Harvesting younger trees have resulted in reduced strength which has reduced spans.

Example—Ceiling Joint Spans

#1 Uninhabitable attic with limited storage

LL = 20 psf
DL = 10 psf
2×10 joists
16″ o.c. spacing
SP #2

Maximum Span Allowed	2012	2015
	20′-9″	18′-1″

The SP #2 span length is significantly reduced from the 2012 IRC span length.

Note: An SP #1 joist will span about the same length in the 2015 IRC Table R802.4(1) or R802.4(2) as the SP #2 did in the tables in the 2012 IRC.

#2 Uninhabitable attic without storage

LL = 10 psf
DL = 5 psf
2×8 joists
24″ o.c. spacing
DFL #2

Maximum Span Allowed	2012	2015
	18′-9″	19′-1″

The span has increased about 2 inches which is the typical increase in the table. Some cells for Douglas fir and Hemlock fir have not changed. Others increased by 1–2 inches.

CHANGE SIGNIFICANCE: New design values exist for most widths and grades of visually graded Southern Pine lumber. These design values became effective on June 1, 2013. The American Lumber Standards Committee (ALSC) approved the new design values as published in Southern Pine Inspection Bureau Supplement No. 13 to the 2002 Standard Grading Rules for Southern Pine Lumber. These values are a result of two years of testing current lumber inventory available on the market to see what changes, if any, had occurred in the strength of the Southern Pine.

Meanwhile, for Douglas Fir-Larch and Hemlock Fir, testing done in the 1990s slightly increased design values for bending. Revised design values for Select Structural, #2, and #3 grades of Douglas Fir-Larch and #1 grade of Hemlock Fir all increased by 25 psi. Testing to check current stock has validated design values set in the 1990s. Although these values were updated in the wood standards, span tables incorporated into the 2000 International Building Code (IBC) and 2000 IRC were based on span tables predating the revised design values from the 1990s. These tables are updated with the 2015 IRC.

The 2015 IRC span tables will now agree with wood standard span tables with the revisions for Southern Pine, Douglas Fir-Larch, and Hemlock Fir. For Southern Pine, the changes reflect shorter spans. For Douglas Fir-Larch and Hemlock Fir, the changes result in slightly longer spans.

The new design values apply only to new construction. The integrity of existing structures designed and built using the design values meeting the applicable building codes in effect at the time of permitting is not a concern.

		Justification: Approved through the ANSI process at the national code development hearings.:
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 ¼-inch (6.4 mm) maximum. Ventilation openings having a least dimension larger than ¼-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 ¼-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.	**R806.1 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 ¼-inch (6.4 mm) maximum. Ventilation openings having a least dimension larger than ¼-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 ¼-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.~~	***City of Houston Amendment*** **Analysis:** ***Modification*** – The 2012 IRC exception allowing the building official to waive ventilation requirements due to atmospheric or climatic conditions has been deleted.  © HerrBullermann/Shutterstock.com. Attic ventilation *CHANGE SIGNIFICANCE: With recent revisions to the IRC roof ventilation requirements, and changes in the 2015 International Building Code, both codes now contain specific details on vented and unvented attics, with requirements related to use of vapor retarders and climate-specific instructions on use of air-impermeable insulation. As the former exception was based on climatic conditions with no direction to the building official on matters related to construction methods or details, it has been deleted. As always, the building official has the authority to accept alternative materials, design, and methods of construction in accordance with Section R104.11.* **Justification:** Approved through the ANSI process at the national code development hearings.:
Table R806.5 **Insulation for Condensation Control in Unvented Attics** **TABLE R806.5 Insulation for Condensation Control** Climate Zone | Minimum Rigid Board on Air-Impermeable Insulation *R*-Value[a,b] 2B and 3B tile roof only | 0 (none required) 1, 2A, 2B, 3A, 3B, 3C | R-5 4C | R-10 4A, 4B | R-15 5 | R-20 6 | R-25 7 | R-30 8 | R-35 a. Contributes to but does not supersede the requirements in Section N1102.	**Table R806.5** **Insulation for Condensation Control in Unvented Attics** **TABLE R806.5 Insulation for Condensation Control** Climate Zone | Minimum Rigid Board on Air-Impermeable Insulation *R*-Value[a,b] 2B and 3B tile roof only | 0 (none required) 1, 2A, 2B, 3A, 3B, 3C | R-5 4C | R-10 4A, 4B | R-15 5 | R-20 6 | R-25 7 | R-30 8 | R-35 a. Contributes to but does not supersede the requirements in Section N1102. b. Alternatively, sufficient continuous insulation shall be installed directly above the structural roof sheathing to maintain the monthly average temperature of the underside of the structural roof sheathing above 45°F (7°C). For calculation purposes, an interior air temperature of 68°F (20°C) is assumed and the exterior air temperature is assumed to be the monthly average outside air temperature of the three coldest months.	***City of Houston Amendment*** **Analysis:** ***Modification*** – For unvented attics and unvented rafter spaces, Table R806.5 has a new footnote allowing calculation of insulation thickness when the insulation is placed above the structural roof sheathing. *CHANGE SIGNIFICANCE: Section R806.5 provides three options for installing insulation at the roof line for unvented attics and unvented rafter spaces: air-impermeable insulation (typically foam plastic) installed directly below the roof sheathing, a combination of air-impermeable and air-permeable insulation installed below the roof sheathing, and air-impermeable insulation (rigid board or sheet insulation) installed above the structural roof sheathing. The minimum R-value for the rigid board or sheet insulation is determined from Table R806.5 based on climate zone to prevent condensation on the underside of the structural roof sheathing. The balance of the required insulation is accomplished with air-permeable insulation installed below the roof sheathing. The R-values in Table R806.5 are based on a total R-49 roof/ceiling insulation in Climate Zones 4, 5, 6, 7, and 8 and R-38 insulation in Climate Zones 2 and 3. Footnote b provides a calculation procedure to determine necessary rigid board or air-impermeable insulation R-values for roof assemblies that do not meet the requirements of Table R806.5. The footnote is consistent with similar language in 2015 IBC Section 1203.3.* **Justification:** Approved through the ANSI process at the national code development hearings.:
SECTION R807 **ATTIC ACCESS**	**SECTION R807** **ATTIC ACCESS**	***City of Houston Amendment***

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
COLOR CODE INDEX: Turquoise = NEW or Modified Text by ICC in 2015 ~~Yellow Strike through~~ = Text Deleted from the Code by COH	Text Underlined = COH Amendment added (NEW) Green Text = NEW or Modified Text by COH in 2015	Grey Text = Previous COH Amendment Brought Forward to 2015 ~~Strike through~~ = Text Deleted from the Code by ICC
R807.1 Attic access. Buildings with combustible ceiling or roof construction shall have an *attic* access opening to *attic* areas that exceed 30 square feet (2.8 m^2) and have a vertical height of 30 inches (762 mm) or greater. The vertical height shall be measured from the top of the ceiling framing members to the underside of the roof framing members. The rough-framed opening shall not be less than 22 inches by 30 inches (559 mm by 762 mm) and shall be located in a hallway or other readily accessible location. When located in a wall, the opening shall be a minimum of 22 inches wide by 30 inches high (559 mm wide by 762 mm high). When the access is located in a ceiling, minimum unobstructed headroom in the *attic* space shall be 30 inches (762 mm) at some point above the access measured vertically from the bottom of ceiling framing members. Stairs or ladders used only to attend equipment are not considered a stairway. See Section M1305.1.3 for access requirements where mechanical *equipment* is located in *attics.*	**R807.1 Attic access.** Buildings with combustible ceiling or roof construction shall have an *attic* access opening to *attic* areas that have a vertical height of 30 inches (762 mm) or greater over an area of not less than 30 square feet (2.8 m^2). The vertical height shall be measured from the top of the ceiling framing members to the underside of the roof framing members. The rough-framed opening shall be not less than 22 inches by 30 inches (559 mm by 762 mm) and shall be located in a hallway or other readily accessible location. Where located in a wall, the opening shall be not less than 22 inches wide by 30 inches high (559 mm wide by 762 mm high). Where the access is located in a ceiling, minimum unobstructed headroom in the attic space shall be 30 inches (762 mm) at some point above the access measured vertically from the bottom of ceiling framing members. ~~Stairs or ladders used only to attend equipment are not considered a stairway.~~ See Section M1305.1.3 for access requirements where mechanical *equipment* is located in *attics*.	**Analysis:** Editorial changes added to the model code provisions of this section for clarity. The COH amendment was omitted. **Justification:** The committee omitted this amendment due to a lack of justification and because it was originally intended to help clarify the language of the section but fails to accomplish this purpose.
2012 Houston IRC – Chapter 9 Roof Assemblies	**2015 Houston IRC – Chapter 9 Roof Assemblies**	**Code Analysis**
SECTION R902 **FIRE CLASSIFICATION** **R902.1 Roofing covering materials.** Roofs shall be covered with materials as set forth in Sections R904 and R905. Class A. B or C roofing shall be installed in areas designated by law as requiring their use or when the edge of the roof is less than 3 feet (914 mm) from a lot line. Classes A, B and C roofing required by this section to be listed shall be tested in accordance with UL 790 or ASTM E 108. **Exceptions:** **1.** Class A roof assemblies include those with coverings of brick, masonry, and exposed concrete roof deck. **2.** Class A roof assemblies also include ferrous or copper shingles or sheets, metal sheets and shingles, clay or concrete roof tile, or slate installed on noncombustible decks. **3.** Class A roof assemblies include minimum 16 oz/ft^2 copper sheets installed over combustible decks. **4.** Residential outbuildings.	**SECTION R902** **FIRE CLASSIFICATION** **R902.1 Roofing covering materials.** Roofs shall be covered with materials as set forth in Sections R904 and R905. Class A, B or C roofing shall be installed in jurisdictions designated by law as requiring their use or where the edge of the roof is less than 3 feet (914 mm) from a lot line. Class A, B and C roofing required by this section to be listed shall be tested in accordance with UL 790 or ASTM E 108. **Exceptions:** **1.** Class A roof assemblies include those with coverings of brick, masonry, and exposed concrete roof deck. **2.** Class A roof assemblies include ferrous or copper shingles or sheets, metal sheets and shingles, clay or concrete roof tile, or slate installed on noncombustible decks. **3.** Class A roof assemblies include minimum 16 ounces per square foot copper sheets installed over combustible decks. **4.** Class A roof assemblies include slate installed over underlayment over combustible decks.	***City of Houston Amendment*** **Analysis:** The COH amendment was omitted because specific provisions apply to residential accessory building in the model code provisions. The amendment is not justified or needed. **Justification:** The committee recommends removing this amendment as it was created to clarify the language of the section but does not accomplish this purpose. *CHANGE SIGNIFICANCE: In IRC 2009 (and similarly in IBC 2009), the historic exemptions from fire testing for certain roof covering types, including copper sheets and slate, over combustible roof decks were amended to require ASTM E 108 or UL 790 fire testing. At the time, a lack of adequate fire test data was cited as the reason for this change.* *In IRC 2012, Exception 3 was added based upon fire testing conducted by the Copper Development Association. The National Roofing Contractors Association and the National Slate Association have conducted fire tests at Underwriters Laboratories, Inc. (UL) that documents slate installed over an underlayment over a combustible deck meets the requirements of UL 790 Class A. This testing substantiates the addition of Exception 4 as a Class A roof assembly.* *This same code change proposal was submitted for the International Building Code as S20-12 in Group A and was Approved as Submitted. A copy of this test report has been submitted with this code change proposal; additional copies are available by contacting the proponent.* **Cost Impact:** This code change proposal will not increase the cost of construction.
R905.7 Wood shingles. The installation of wood shingles shall comply with the provisions of this section.	**R905.7 Wood shingles and wooden shakes.** ~~The installation of wood shingles shall comply with the provisions of this section.~~ Wood shingles and wooden shakes shall not be used in new construction. Wood shingles or wooden shakes in existing construction shall not be replaced with other wood shingles or wooden shakes unless the replacement wood shingles, or wooden shakes are fire-retardant-treated in accordance with Section R902.2 and installed in accordance with this section.	***City of Houston Amendment*** **Analysis:** A COH amendment was added to the IRC 2015 to coordinate with an existing IBC amendment to provide a minimum level of fire safety intended to prevent the spready of fire from falling cinders associated with adjacent fires. **Justification:** This amendment is needed to ensure conformity with other provisions of the Houston Construction Code and state and local HFD policy.
R905.2.3 Underlayment. Unless otherwise noted, required underlayment shall conform to ASTM D 226 Type I, ASTM D 4869 Type I, or ASTM D 6757. Self-adhering polymer modified bitumen sheet shall comply with ASTM D 1970.	**R905.1.1 Underlayment.** Underlayment for asphalt shingles, clay and concrete tile, metal roof shingles, mineral-surfaced roll roofing, slate and slate-type shingles, wood shingles, wood shakes, and metal roof panels shall conform to the applicable standards listed in this chapter. Underlayment materials required to comply with ASTM D226, D1970,	***City of Houston Amendment*** **Analysis:** ***Modification*** – The multiple code provisions placed in the 2012 IRC for underlayment have been combined into Section R905.1.1, with three tables listing underlayment type, application, and attachment. Sections on ice barriers from the 2012 IRC are reorganized and combined into new Section R905.1.2.

D4869, and D6757 shall bear a label indicating compliance to the standard designation and, if applicable, type classification indicated in Table R905.1.1(1). Underlayment shall be applied in accordance with Table R905.1.1(2). Underlayment shall be attached in accordance with Table R905.1.1(3).

Exceptions:

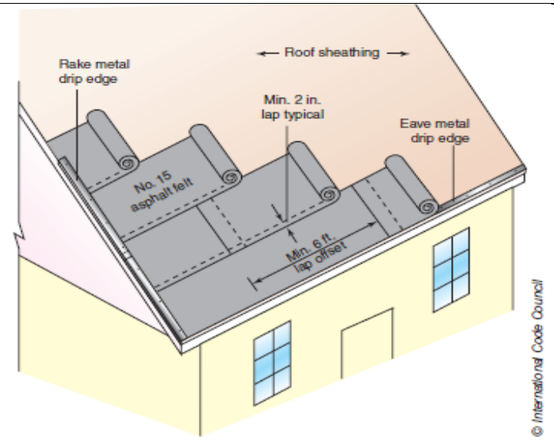
1. As an alternative, self-adhering polymer modified bitumen underlayment complying with ASTM D1970 installed in accordance with both the underlayment manufacturers and roof covering manufacturer's installation instructions for the deck material, roof ventilation configuration, and climate exposure for the roof covering to be installed, shall be permitted.
2. As an alternative, a minimum 4-inch (102 mm) wide strip of self-adhering polymer-modified bitumen membrane complying with ASTM D 1970 installed in accordance with the manufacturer's installation instructions for the deck material, shall be applied over all joints in the roof decking. An approved underlayment for the applicable roof covering for maximum ultimate design wind speeds, Vult, less than 140 mph (63 m/s) shall be applied over the entire roof over the 4-inch (102 mm) wide membrane strips.

TABLE R905.1.1(1) Underlayment Types

Roof Covering	Section	Maximum Ultimate Design Wind Speed, V_{ult} < 140 mph	Maximum Ultimate Design Wind Speed, V_{ult} ≥ 140 mph
Asphalt shingles	R905.2	ASTM D 226 Type I; ASTM D 4869 Type I, II, III, or IV; ASTM D 6757	ASTM D 226 Type II; ASTM D 4869 Type IV; ASTM D 6757
Clay and concrete tile	R905.3	ASTM D 226 Type II; ASTM D 2626 Type I; ASTM D 6380 Class M mineral surfaced roll roofing	ASTM D 226 Type II; ASTM D 2626 Type I; ASTM D 6380 Class M mineral surfaced roll roofing
Metal roof shingles	R905.4	ASTM D 226 Type I or II; ASTM D 4869 Type I, II, III, or IV	ASTM D 226 Type II; ASTM D 4869 Type IV
Mineral-surfaced roll roofing	R905.5	ASTM D 226 Type I or II; ASTM D 4869 Type I, II, III, or IV	ASTM D 226 Type II; ASTM D 4869 Type IV
Slate and slate-type shingles	R905.6	ASTM D 226 Type I; ASTM D 4869 Type I, II, III, or IV	ASTM D 226 Type II; ASTM D 4869 Type IV
Wood shingles	R905.7	ASTM D 226 Type I or II; ASTM D 4869 Type I, II, III, or IV	ASTM D 226 Type II; ASTM D 4869 Type IV
Wood shakes	R905.8	ASTM D 226 Type I or II; ASTM D 4869 Type I, II, III, or IV	ASTM D 226 Type II; ASTM D 4869 Type IV
Metal panels	R905.10	Manufacturer's instructions	ASTM D 226 Type II; ASTM D 4869 Type IV

R905.1.2 Ice Barriers. In areas where there has been a history of ice forming along the eaves causing a backup of water as designated in Table R301.2(1), an ice barrier shall be installed for asphalt shingles, metal roof shingles, mineral-surfaced roll roofing, slate and slate-type shingles, wood shingles and wood shakes. The ice barrier shall consist of not fewer than two layers of underlayment cemented together, or a self-adhering polymer modified bitumen sheet shall be used in place of normal underlayment and extend from the lowest edges of all roof surfaces to a point at least 24 inches (610 mm) inside the exterior wall line of the building. On roofs with slope equal to or greater than 8 units vertical in 12 units horizontal, the ice barrier shall also be applied not less than 36 inches (914 mm) measured along with the roof slope from the eave edge of the building.

Exception: Detached accessory structures that contain no conditioned floor area.



Underlayment

Change Significance: This code change reorganizes the underlayment provisions contained within the IRC. In the 2012 IRC, underlayment provisions were specified individually for each type of roof covering. Many of the roof covering provisions contained identical requirements for underlayment type, application, and attachment. This change relocates the underlayment requirements for roof covering to a single section at the beginning of Section R905. There are three new tables that address underlayment type (Table R905.1.1[1]), application (Table R905.1.1[2]), and attachment (Table R905.1.1[3]) for each roof covering in the IRC that requires underlayment. Consolidating the underlayment requirements into a single section makes provisions easier to locate and highlights key differences between requirements for underlayment for different types of roof coverings. For metal roof panels in areas with wind speeds of 140 mph or greater, ASTM D4869 Type IV underlayment is added as an approved underlayment.

Justification: Approved through the ANSI process at the national code development hearings.**:**

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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TABLE R905.1.1(2) Underlayment Application

Roof Covering	Section	Maximum Ultimate Design Wind Speed, V_{ult} < 140 mph	Maximum Ultimate Design Wind Speed, V_{ult} ≥ 140 mph
Asphalt shingles	R905.2	For roof slopes from two units vertical in 12 units horizontal (2:12), up to four units vertical in 12 units horizontal (4:12), underlayment shall be two layers applied in the following manner. Apply a 19-inch strip of underlayment felt parallel to and starting at the eaves. Starting at the eave, apply 36-inch-wide sheets of underlayment, overlapping successive sheets 19 inches. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. For roof slopes of four units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied in the following manner. Underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped 2 inches. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. End laps shall be 4 inches and shall be offset by 6 feet.	Same as Maximum Ultimate Design Wind Speeds, V_{ult} < 140 mph except all laps shall be a minimum of 4 inches.
Clay and concrete tile	R905.3	For roof slopes from two and one-half units vertical in 12 units horizontal (2 ½:12), up to four units vertical in 12 units horizontal (4:12), underlayment shall be a minimum of two layers applied as follows: starting at the eave, apply a 19-inch strip of underlayment parallel with the eave. Starting at the eave, apply 36-inch-wide strips of underlayment felt, overlapping successive sheets 19 inches. For roof slopes of four units vertical in 12 units horizontal (4:12) or greater, underlayment shall be a minimum of one layer of underlayment felt applied shingle fashion, parallel to and starting from the eaves and lapped 2 inches. End laps shall be 4 inches and shall be offset by 6 feet.	Same as Maximum Ultimate Design Wind Speeds, V_{ult} < 140 mph except all laps shall be a minimum of 4 inches.
Metal roof shingles Mineral-surfaced roll roofing Slate and slate-type shingles Wood shingles Wood shakes Metal panels	R905.4 R905.5 R905.6 R905.7 R905.8 R905.10	Apply in accordance with the manufacturer's installation instructions.	For roof slopes from two units vertical in 12 units horizontal (2:12), up to four units vertical in 12 units horizontal (4:12), underlayment shall be two layers applied in the following manner: apply a 19-inch strip of underlayment felt parallel to and starting at the eaves. Starting at the eave, apply 36-inch-wide sheets of underlayment, overlapping successive sheets 19 inches, and fastened sufficiently to hold in place. For roof slopes of four units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied in the following manner: underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped 4 inches. End laps shall be 4 inches and shall be offset by 6 feet.

TABLE R905.1.1(3) Underlayment Attachment

Roof Covering	Section	Maximum Ultimate Design Wind Speed, V_{ult} ≤ 140 mph	Maximum Ultimate Design Wind Speed, V_{ult} ≥ 140 mph
Asphalt shingles	R905.2	Fastened sufficiently to hold in place	The underlayment shall be attached with corrosion-resistant fasteners in a grid pattern of 12 inches between side laps with a 6-inch spacing at the side laps. Underlayment shall be attached using metal or plastic cap nails or cap staples with nominal cap diameter of not less than 1 inch. Metal caps shall have a thickness not less than 32-gauge sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. Minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap-nail shank shall be not less than 0.083 inch for ring shank cap nails and 0.091 inch for smooth shank cap nails. Staple gage shall be not less than 21 gage. Cap-nail shank and cap staple legs shall have a length sufficient to penetrate through the roof sheathing or not less than ¾ inch into the roof sheathing.
Clay and concrete tile	R905.3		
Metal roof shingles	R905.4	Manufacturer's installation instructions.	The underlayment shall be attached with corrosion resistant fasteners in a grid pattern of 12 inches between side laps with a 6-inch spacing at the side laps. Underlayment shall be attached using metal or plastic cap nails or cap staples with nominal cap diameter of not less than 1 inch. Metal caps shall have a thickness of at least 32-gauge sheet metal. Power-driven metal caps shall have a minimum thickness of 0.010 inch. Minimum thickness of the outside edge of plastic caps shall be 0.035 inch. The cap-nail shank shall be not less than 0.083 inch for ring shank cap nails and 0.091 inch for smooth shank cap nails. Staple gage shall be not less than 21 gage. Cap-nail shank and cap staple legs shall have a length sufficient to penetrate through the roof sheathing or not less than ¾ inch into the roof sheathing.
Mineral-surfaced roll roofing	R905.5		
Slate and slate-type shingles	R905.6		
Wood Shingles	R905.7		
Wood shakes	R905.8		
Metal panels	R905.10		

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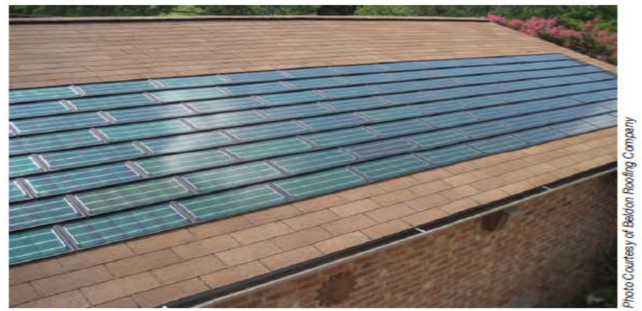
	R905.16 Photovoltaic modules/shingles. The installation of photovoltaic ~~modules/~~shingles shall comply with the provisions of this section, Section R324 and NFPA 70. **R905.16.1 Deck requirements.** Photovoltaic shingles shall be applied to a solid or closely fitted deck, except where the roof covering is specifically designed to be applied over spaced sheathing. **R905.16.2 Deck slope.** Photovoltaic shingles shall be used only on roof slopes of two units vertical in 12 units horizontal (2:12) or greater. **R905.16.3 Underlayment.** Unless otherwise noted, required underlayment shall conform to ASTM D4869 or ASTM D6757. **R905.16.4 Underlayment application.** Underlayment shall be applied shingle fashion, parallel to and starting from the eave, lapped 2 inches (51 mm), and fastened sufficiently to hold in place. **R905.16.4.1 Ice barrier.** In areas where there has been a history of ice forming along the eaves causing a backup of water as designated in Table R301.2(1), an ice barrier that consists of not less than two layers of underlayment cemented together or of a self-adhering polymer-modified bitumen sheet, shall be used in lieu of normal underlayment and extend from the lowest edges of all roof surfaces to a point not less than 24 inches (610 mm) inside the exterior wall line of the building. **Exception:** Detached accessory structures that contain no conditioned floor area. **R905.16.4.2 Underlayment and high winds.** Underlayment applied in areas subject to high winds [above 140 mph (63 m/s) in accordance with Figure R301.2(4)A] shall be applied with corrosion-resistant fasteners in accordance with the manufacturer's installation instructions. Fasteners are to be applied along the overlap not farther apart than 36 inches (914 mm) on center. Underlayment installed where the ultimate design wind speed equals or exceeds 150 mph (67 m/s) shall comply with ASTM D4869 Type IV, or ASTM D6757. The underlayment shall be attached in a grid pattern of 12 inches (305 mm) between side laps with a 6-inch (152 mm) spacing at the side laps. Underlayment shall be applied as required for asphalt shingles in accordance with Table R905.1.1(2). Underlayment shall be attached using metal or plastic cap nails with a head diameter of not less than 1 inch (25.4 mm) with a thickness of not less than 32-gage sheet metal. The cap-nail shank shall be not less than 12-gage (0.105 inches) with a length to penetrate through the roof sheathing or not less than 3/4 inch (19 mm) into the roof sheathing. **Exception:** As an alternative, adhered underlayment complying with ASTM D1970 shall be permitted.	***City of Houston Amendment*** **Analysis:** ***Modification*** – This section is extensively modified. New requirements identify limits for photovoltaic shingles in Section R905.16. The section provides guidance for installers and code officials regarding the installation of photovoltaic shingles. These shingles are integrated with the building and provide both a roof covering and source of electrical power. The installation must also comply with the applicable portions of Section R324 and the NFPA 70. These provisions supply requirements and limitations for roof decks, roof deck slope, underlayment, underlayment application, ice barriers and underlayment attachment in high-wind regions that are considered appropriate for the installation of photovoltaic shingles. The specific requirements included here have been adapted from and are intended to be consistent with similar attributes for other shingle-type roof coverings. Section 905.16.1 is adapted from Section R905.4.1; Section R905.16.2 is adapted from Section R905.2.2; Sections R905.16.3, R905.16.4 and R905.16.4.2 are adapted from Section R905.1.1 and Section R905.16.4.1 is adapted from Section R905.1 .2.  Photo Courtesy of Beldon Roofing Company Photovoltaic shingle *Change Significance: Section R905.16, Photovoltaic Shingles, is expanded. The section now contains requirements for roof decks, minimum roof deck slope, underlayment, underlayment application, ice barrier, and underlayment for high-wind areas. The new requirements are consistent with similar attributes for other non-flat, shingle-type roof coverings. Reference to NFPA 70 and Section R324 for photovoltaic solar energy systems is added.* *The word "modules" is deleted from the section title because it is not defined in the code for photovoltaic applications. "Photovoltaic shingles" is now the descriptor for this application. Additionally, the section mirrors the information and format found in the 2015 International Building Code for photovoltaic shingles.* **Justification:** Approved through the ANSI process at the national code development hearings.:
N/A	**R907.1 Rooftop-Mounted photovoltaic systems.** Rooftop-mounted photovoltaic panels or modules shall be installed in accordance with this section, Section R324 and NFPA 70. **R907.2 Wind resistance.** Rooftop-mounted photovoltaic panel or modules systems shall be installed to resist the component and cladding loads specified	***City of Houston Amendment*** **Analysis:** ***Addition*** – This new model code provision describes the requirements and limits of rooftop-mounted photovoltaic systems.

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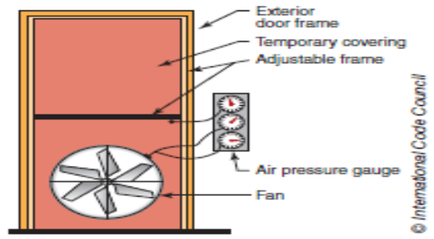
	in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3). **R907.3 Fire classification.** Rooftop-mounted photovoltaic panels or modules shall have the same fire classification as the roof assembly required in Section R902. **R907.4 Installation.** Rooftop-mounted photovoltaic panels or modules shall be installed in accordance with the manufacturer's installation instructions. **R907.5 Photovoltaic panels and modules.** Rooftop-mounted photovoltaic panels and modules shall be listed and labeled in accordance with UL 1703 and shall be installed in accordance with the manufacturer's printed instructions.	 Photo Courtesy of Peter Kulczyk Rooftop-mounted photovoltaic system *Change Significance: Specific requirements applicable to rooftop-mounted photovoltaic panels and modules are added. These provisions complement the existing requirements for photovoltaic solar energy systems in Section R324. The new section also references requirements in NFPA 70. Panels and modules must be listed and labeled to meet the requirements of UL 1703.* *Requirements for resistance of component and cladding loads and minimum fire classification are added. Installation is in accordance with the manufacturer's directions. These requirements mirror provisions in the 2015 International Building Code.* **Justification:** Approved through the ANSI process at the national code development hearings.**:**
2012 Houston IRC – Chapter 10 Chimneys and Fireplaces	**2015 Houston IRC – Chapter 10 Chimneys and Fireplaces**	**Code Analysis**
R1006.2 Exterior air intake. The exterior air intake shall be capable of supplying all *combustion air* from the exterior of the *dwelling* or from spaces within the *dwelling* ventilated with outside air such as nonmechanically ventilated crawl or *attic* spaces. The exterior air intake shall not be located within the garage or *basement* of the *dwelling* ~~nor shall the air intake be located at an elevation higher than the firebox~~. The exterior air intake shall be covered with a corrosion-resistant screen of ¼-inch (6 mm) mesh.	**R1006.2 Exterior air intake.** The exterior air intake shall be capable of supplying all *combustion air* from the exterior of the *dwelling* or from spaces within the *dwelling* ventilated with outdoor air such as nonmechanically ventilated crawl or *attic* spaces. The exterior air intake shall not be located within the garage or basement of the dwelling. The exterior air intake, for other than listed factory-built fireplaces, shall not be located at an elevation higher than the firebox. The exterior air intake shall be covered with a corrosion-resistant screen of 1/4-inch (6.4 mm) mesh.	***City of Houston Amendment*** **Analysis:** The COH amendment was omitted. **Justification:** The committee recommends removing this amendment as it was created to clarify the language of the section but does not accomplish this purpose.
2012 Houston IRC – Part 4—Chapter 11 [RE] Energy Efficiency	**2015 Houston IRC C – Part 4—Chapter 11 [RE] Energy Efficiency**	**Code Analysis**
Part 4—Chapter 11 [RE] Energy Efficiency ■ ***Chapter 11 Energy Efficiency*** *The IRC energy provisions are extracted from the residential provisions of the International Energy Conservation Code (IECC) and editorially revised to conform to the scope and application of the IRC. The section numbers appearing in parentheses after each IRC section number are the section numbers of the corresponding text in the IECC. The IECC Residential Provisions and Chapter 11 of the IRC provide for the effective use and conservation of energy in new residential buildings by regulating the building envelope, mechanical systems, electrical systems, and service water heating systems. IRC Section N1101 establishes climate zones for geographical locations as the basis for determining thermal envelope requirements for conserving energy. The various elements of the building thermal envelope are covered in Section N1102 and include specific insulation, fenestration, and air-leakage requirements for improving energy efficiency. Section N1103 primarily is concerned with mechanical system controls, insulation and sealing of ductwork, equipment sizing, and mandatory mechanical ventilation systems. The insulation of mechanical and service hot water piping systems is also covered in the mechanical systems provisions of Section N1103. Energy-efficient lighting is covered in Section N1104. Alternative compliance provisions appear in Sections N1105 and N1106. The new Sections N1107 through N1111 address the application of the energy provisions for work performed on existing buildings.* **N1101.13**-Compliance Paths; **N1101.14**-Permanent Energy Certificate; **N1102.1.3**-*R*-Value Computation—Insulated Siding; **N1102.2.4**-Access Hatches and Doors; **N1102.2.7, TABLE N1102.1.2**-*R*-Value Reduction for Walls with Partial Structural Sheathing; **N1102.2.8, TABLE N1102.4.1.1**-Floor Framing Cavity Insulation; **Table N1102.4.1.1**-Insulation at Wall Corners and Headers; **1102.4.2, Table N1102.4.1.1**-Wood-Burning Fireplace Doors; **N1103.3**-Duct Sealing and Testing; **N1103.5**-Heated Water Circulation and Temperature Maintenance Systems		
2012 Houston IRC – Chapter 11 [RE] Energy Efficiency	**2015 Houston IRC – Chapter 11 [RE] Energy Efficiency**	**Code Analysis**
N1101.1 Scope. ~~This chapter~~ The *International Energy Conservation Code* regulates the energy efficiency for the design and construction of buildings regulated by this code. **{EDITORIAL NOTE: DELETE** THE REMAINDER OF THIS CHAPTER IN ITS ENTIRETY.}	**N1101.1 Scope.** ~~This chapter~~ The *Energy Conservation Code* regulates the energy efficiency for the design and construction of buildings regulated by this code. {**EDITORIAL NOTE:** DELETE THE REMAINDER OF THIS CHAPTER IN ITS ENTIRETY.}	***City of Houston Amendment*** **Analysis:** The existing amendment includes a minor editorial change to correlate with definitions in the 2015 volumes of the Houston Construction Code. No change to the code requirements or code intent.

		Justification: This amendment was modified to ensure that the code references adopted codes that are applicable in the jurisdiction.
N1101.15 (R401.2) Compliance. Projects shall comply with Sections identified as "mandatory" and with either sections identified as "prescriptive" or the performance approach in Section N1105.	~~**N1101.15**~~ **N1101.13 (R401.2) Compliance.** Projects shall comply with Sections identified as "mandatory" and with ~~either sections identified as "prescriptive" or the performance approach in Section N1105.~~ one of the following: **1.** Sections N1101.14 through N1104. **2.** Section N1105 and the provisions of Sections N1101.14 through N1104 labeled "Mandatory." **3.** An energy rating index (ERI) approach in Section N1106.  Blower door test: Air-leakage provisions, including testing of the building thermal envelope, are mandatory.	***City of Houston Amendment*** **Analysis:** ***Modification*** – The compliance paths in the energy provisions have been clarified. The mandatory provisions combined with either the prescriptive provisions or the performance provisions are deemed to comply with the code. *Change Significance: Several sections in the energy provisions are labeled as "mandatory." There are no trade-offs or equivalency provisions for these sections. For example, Section N1101.14 requires a permanent energy certificate to be posted in the building. Likewise, the code mandates the limits and testing requirements for the air-leakage provisions related to the building thermal envelope in Section N1102.4. Section N1103.3.3 sets the circumstances requiring duct testing and mandates the methods for conducting that testing. These mandatory provisions must be complied with in pursuing any path for satisfying the energy efficiency requirements in the code. Sections labeled as "prescriptive" offer clear rules to follow to gain compliance with the code. The prescriptive rules are easiest to follow and the most used in combination with the mandatory provisions for achieving compliance.* *However, the designer or builder may choose alternative performance methods to demonstrate compliance rather than follow the prescriptive provisions. The code offers a simulated performance alternative in Section N1105 and an energy rating index compliance alternative in new Section N1106. Both methods employ approved compliance software to generate compliance reports that demonstrate equivalency with the prescriptive provisions for conserving energy. The various compliance paths offered in Section N1101.13 are consistent with the intent statement in Section N1101.2 that the energy provisions intend to provide flexibility to permit the use of innovative approaches and techniques to achieve the objective for effective use and conservation of energy. Section N1101.3 authorizes the building official to accept specific computer software and calculation methods to meet the intent of the code. Likewise, the building official is authorized to approve a national, state, or local energy efficiency program as exceeding the energy efficiency requirements of the IRC and therefore in compliance with the code.* **Justification:** New changes approved through the ANSI process at the national code development hearings.
N1101.16 (R401.3) Certificate (Mandatory). A permanent certificate shall be completed and posted on or in the electrical distribution panel by the builder or registered design professional. The certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certificate shall list the predominant *R*-values of insulation installed in or on ceiling/ roof, walls, foundation (slab, *basement wall,* crawl space wall and/or floor) and ducts outside conditioned spaces; *U*-factors for fenestration and the solar heat gain coefficient (SHGC) of fenestration, and the results from any required duct system and building envelope air leakage testing done on the building. Where there is more than one value for each component, the certificate shall list the value covering the largest area. The certificate shall list the types and efficiencies of heating, cooling and service water heating equipment. Where a gas-fired unvented room heater, electric furnace, or baseboard electric heater is installed in the residence, the certificate shall list "gas-fired unvented room heater," "electric furnace" or "baseboard electric heater," as appropriate. An efficiency shall not be *listed* for gas-fired unvented room heaters, electric furnaces, or electric baseboard heaters**.**	**N1101.14 (R401.3) Certificate (Mandatory).** A permanent certificate shall be completed by the builder or registered design professional and posted on a wall in the space where the furnace is located, a utility room or an approved location inside the building. Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certificate shall list the predominant *R*-values of insulation installed in or on ceiling/roof, walls, foundation (slab, *basement wall,* crawl space wall and/or floor) and ducts outside conditioned spaces; *U*-factors for fenestration and the solar heat gain coefficient (SHGC) of fenestration, and the results from any required duct system and building envelope air leakage testing done on the building. Where there is more than one value for each component, the certificate shall list the value covering the largest area. The certificate shall list the types and efficiencies of heating, cooling and service water heating equipment. Where a gas-fired unvented room heater, electric furnace, or baseboard electric heater is installed in the residence, the certificate shall list "gas-fired unvented room heater," "electric furnace" or "baseboard electric heater," as appropriate. An efficiency shall not be *listed* for gas-fired unvented room heaters, electric furnaces, or electric baseboard heaters**.**	***City of Houston Amendment*** **Analysis:** ***Modification*** – The code now requires the permanent energy certificate to be placed on a wall in proximity to the furnace, in a utility room, or in another approved location inside the building. *Change Significance: The IRC requires the builder or registered design professional to complete an energy efficiency certificate for each dwelling and to post the certificate for permanent display. The certificate lists the installed insulation and fenestration values, and the results of air-leakage tests. The certificate must also list the type and efficiency of installed heating, cooling, and water heating equipment. Because electric furnaces, baseboard heaters, and unvented gas-fired heaters may not provide the lowest energy consumption when compared to other methods of comfort heating and their energy efficiency ratings may be misleading, the code requires such appliances to be individually listed on the certificate without an efficiency designation.* *Previously, the code required the permanent certificate to be affixed to the electrical service panel in a way that did not cover the service directory or other required information governed by the electrical code or the listing of the panel. In some cases, particularly in certain regions of the United States, the electrical service panel is located on the outside of a building and exposed to the weather. There has been a concern that a certificate placed in an outdoor location will be destroyed in a short period of time. The IRC has not permitted such an installation because it prescribes a permanent certificate. Other concerns described the lack of visibility of a certificate installed inside an electrical panel and the distraction of having extra information in or on the panel that is not related to the required safety information that is part of the electrical installation.* *The 2015 IRC addresses these concerns by requiring that the permanent energy certificate be installed inside the building. There are two prescribed locations—in a space that contains the furnace or a utility*

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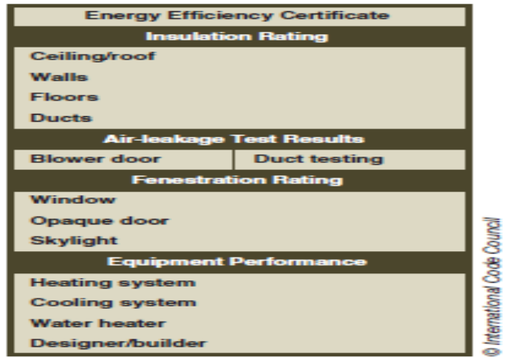
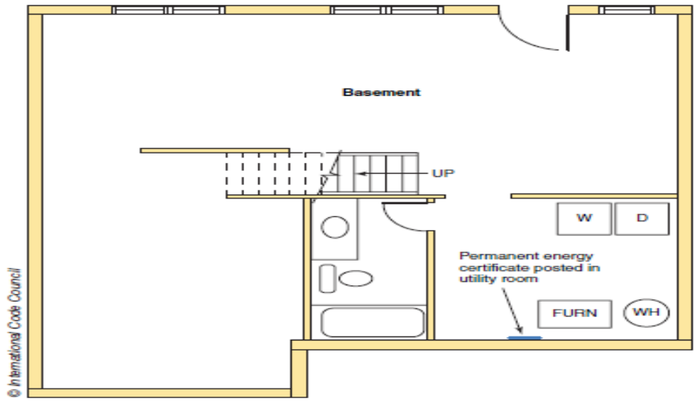


Permanent energy certificate



A permanent energy certificate must be posted inside the building.

room. The intent is that the certificate be in proximity to the furnace or other mechanical equipment where it will be visible to the homeowner. As an alternative, the code allows other locations if they are inside the building and approved by the building official. If approved, a certificate posted in or on an electrical service panel is still allowed by the code, provided it is inside the building and it does not interfere with the visibility of the required labels of the electrical equipment.

Justification: Approved through the ANSI process at the national code development hearings.

N1102.1.2 (R402.1.2) *R*-value computation. Insulation material used in layers, such as framing cavity insulation and insulating sheathing, shall be summed to compute the component *R*-value. The manufacturer's settled *R*-value shall be used for blown insulation. Computed *R*-values shall not include an *R*-value for other building materials or air films.

N1102.1.3 (R402.1.3) R-value computation. Insulation material used in layers, such as framing cavity insulation or continuous insulation, shall be summed to compute the corresponding component R-value. The manufacturer's settled R-value shall be used for blown insulation. Computed R-values shall not include an R-value for other building materials or air films. Where insulated siding is used for the purpose of complying with the continuous insulation requirements of Table N1102.1.2, the manufacturer's labeled R-value for insulated siding shall be reduced by R-0.6.

N1101.6 and R202 include new defined terms.

Continuous insulation (ci). Insulating material that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior or exterior or is integral to any opaque surface of the building envelope.

Insulated siding. A type of continuous insulation with manufacturer installed insulating material as an integral part of the cladding product having a minimum R-value of R-2.

Insulated vinyl siding. A vinyl cladding product with manufacturer installed foam plastic insulating material as an integral part of the cladding product, having a thermal resistance of not less than R-2.

City of Houston Amendment

Analysis: ***Modification*** – The code now allows insulated siding to be used in the calculation for satisfying the wall insulation R-value. The labeled R-value for the siding must be reduced by R-0.6 for calculation purposes.

Change Significance: The prescriptive provisions setting the minimum thermal resistance (R-value) for insulation of the building thermal envelope are based on the installed R-value of the insulation only. Typically, insulation is either cavity insulation or continuous insulation, or a combination. In some climate zones the code prescribes a combination. For example, for Climate Zones 6 through 8, the code prescribes a minimum R-20 cavity insulation combined with a minimum R-5 continuous insulation for walls of the building thermal envelope. Because continuous insulation covers all structural members, there are no thermal gaps at the wall studs, plates, or headers and the insulation is more effective at conserving energy and reducing air leakage when compared to cavity insulation. The improved efficiency is recognized in the code-prescribed wall R-values in Climate Zones 3 through 5, where a combination of R-13 cavity insulation plus R-5 continuous insulation is shown as an option that is equivalent to R-20 cavity insulation.

For the prescriptive building thermal envelope provisions, the code does not allow a component or assembly approach for satisfying the R-value requirements. Only the insulation R-value counts in satisfying the requirement. No credit is given for interior or exterior finishes, air barriers, water-resistive barriers, or other components or materials of the thermal envelope. For that reason, siding has been excluded from this calculation for wall R-value. The 2015 IRC adds a definition for insulated siding, which is siding with rigid foam insulation that is laminated or permanently attached to the siding material by the manufacturer. The minimum thermal resistance of this product is R-2. A new definition for insulated siding considers the siding to be continuous insulation and permits it to contribute to the wall insulation calculation. A reduction of R-0.6 must be applied to the manufacturer's labeled R-value. Insulated siding labeled as having a thermal resistance of R-3.6 (based on testing to ASTM C1363) receives an R-3.0 for calculation purposes in complying with the insulation provisions.

Justification: Approved through the ANSI process at the national code development hearings.

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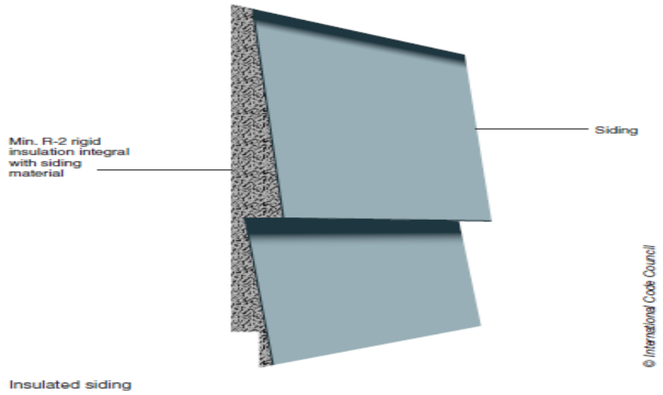
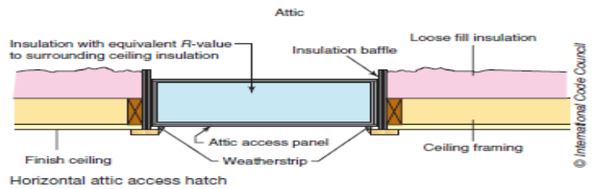
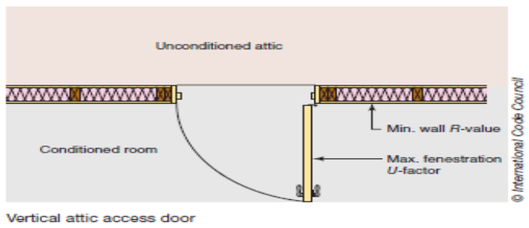
	 Insulated siding	
N1102.2.4 (R402.2.4) Access hatches and doors. Access doors from conditioned spaces to unconditioned spaces (e.g., attics and crawl spaces) shall be weather-stripped and insulated to a level equivalent to the insulation on the surrounding surfaces. Access shall be provided to all equipment that prevents damaging or compressing the insulation. A wood framed or equivalent baffle or retainer is required to be provided when loose fill insulation is installed, the purpose of which is to prevent the loose fill insulation from spilling into the living space when the attic access is opened, and to provide a permanent means of maintaining the installed *R*-value of the loose fill insulation.	**N1102.2.4 (R402.2.4) Access hatches and doors.** Access doors from conditioned spaces to unconditioned spaces such as attics and crawl spaces shall be weather-stripped and insulated to a level equivalent to the insulation on the surrounding surfaces. Access shall be provided to all equipment that prevents damaging or compressing the insulation. A wood-framed or equivalent baffle or retainer is required to be provided when loose fill insulation is installed, the purpose of which is to prevent the loose fill insulation from spilling into the living space when the attic access is opened, and to provide a permanent means of maintaining the installed *R*-value of the loose fill insulation. **Exception:** Vertical doors that provide access from conditioned to unconditioned spaces shall be permitted to meet the fenestration requirements of Table N1102.1.2 based on the applicable climate zone specified in Section N1101.7.  Horizontal attic access hatch  Vertical attic access door	***City of Houston Amendment*** **Analysis:** ***Clarification*** – Vertical doors that access unconditioned attics and crawl spaces do not require an R-value to match the required wall insulation. Such doors must comply with the fenestration U-factor requirements of Table N1102.1.2. *Change Significance: Provisions introduced in the 2009 edition of the IRC clarified that the building thermal envelope requirements apply to hatches and doors that access unconditioned areas such as attics and crawl spaces. The primary intent was to regulate typical attic access hatches that are installed in the ceiling of the dwelling unit to gain entry to the unconditioned attic. In addition to meeting the R-value of the area surrounding the access hatch, the code calls for weatherstripping of the hatch to reduce air leakage and infiltration. The code also provides for a baffle or barrier to retain loose fill insulation at the access opening and to maintain the installed R-value of the insulation. The provision for a baffle seems to imply that the section applies to horizontal access hatches in ceilings. However, the section title includes doors, and many code users understood that the insulation R-value applied to a vertical door used to provide access from conditioned to unconditioned space. A typical installation would be a door in a wall separating a second-floor room from the unconditioned attic of a single-story portion of the building.* *The 2015 IRC specifically excludes vertical access doors from the requirement for meeting the required R-value of the surrounding wall. Proponents of this change reasoned that such a requirement conflicts with the provisions that apply to exterior doors. Both an access door and an exterior door serve to move from a conditioned space to an unconditioned space, define a portion of the building thermal envelope, and should have the same minimum thermal resistance properties. Table N1102.1.2 requires fenestration, which includes doors, to comply with the maximum U-factor. For example, in Climate Zone 5, the table sets a maximum U-factor of 0.32 for an exterior door. The provisions for wood frame wall insulation would require a minimum R-value of R-20, which is much more stringent than the maximum U-factor and would be difficult to achieve with a standard exterior door. The 2015 IRC clarifies that the fenestration U-factor from the table applies to a vertical door used for access to an unconditioned space such as an attic. For a horizontal access hatch to the attic, the insulation for the hatch must meet the minimum ceiling R-value, which for Climate Zone 5 is R-49.* **Justification:** Approved through the ANSI process at the national code development hearings.

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TABLE N1102.1.1 (R402.1.1)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION *U*-FACTOR[b]	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION 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	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13 + 5[h]	8/13	19	5/13[f]	0	5/13
4 except Marine	0.35	0.55	0.40	49	20 or 13 + 5[h]	8/13	19	10 /13	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49	20 or 13 + 5[h]	13/17	30[g]	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20 + 5 or 13 + 10[h]	15/20	30[g]	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20 + 5 or 13 + 10[h]	19/21	38[g]	15/19	10, 4 ft	15/19

For SI: 1 foot = 304.8 mm.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. 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.

c. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. "15/19" shall be permitted to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.

d. R-5 shall be added to the required slab edge *R*-values for heated slabs. Insulation depth shall be the depth of the footing or 2 feet, whichever is less in Zones 1 through 3 for heated slabs.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation is not required in warm-humid locations as defined by Figure N1101.10 and Table N1101.10.

g. Or insulation sufficient to fill the framing cavity, R-19 minimum.

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 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.

i. The second *R*-value applies when more than half the insulation is on the interior of the mass wall.

N1102.2.7 (R402.2.7) Walls with partial structural sheathing. Where Section N1102.1.2 would require continuous insulation on exterior walls and structural sheathing covers 40 percent or less of the gross area of all exterior walls, the continuous insulation *R*-value shall be permitted to be reduced by an amount necessary to result in a consistent total sheathing thickness, but not more than R-3, on areas of the walls covered by structural sheathing, This reduction shall not apply to the *U*-factor alternative approach in Section N1102.1.4 and the total UA alternative in Section N1102.1.5.

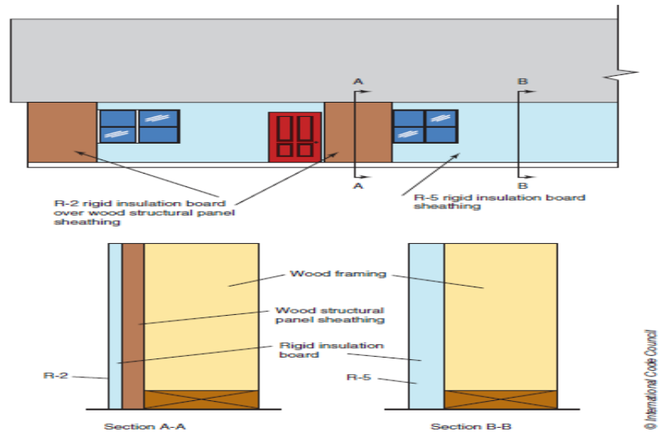
Table ~~N1102.1.1~~ N1102.1.2 (R402.1.2) Insulation and Fenestration Requirements by Component

(Portions of table not shown remain unchanged.)

h. The first value is cavity insulation, the second value is continuous insulation, so 013 1 50 means R-13 cavity insulation plus R-5 continuous insulation. ~~If structural sheathing covers 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.~~

City of Houston Amendment

Analysis: ***Clarification*** – The allowed R-value reduction for portions of walls with structural sheathing and requiring continuous insulation has been moved from footnote h of Table N1102.1.2 and placed in a new section to clarify the application.



R-value reduction for walls with partial structural sheathing

Change Significance: New section N1102.2.7 clarifies the provisions for reducing the required R-value for portions of walls having structural sheathing and requiring continuous insulation. Previously, this reduction was covered in footnote h of Table N1102.1.1 (now Table N1102.1.2) that sets values for insulation and fenestration of the various components of the building thermal envelope. There is no change to the technical requirements related to the reduction in R-value. Moving the relevant text out of the footnote and into a separate code section allows for a more thorough description of the provision that is easier to locate and improves understanding of the code. Structural sheathing refers to wood structural panels or structural fiberboard, or other similar products used to comply with the wood wall bracing requirements. In the northernmost Climate Zones 6 through 8, Table N1102.1.2 requires wall cavity insulation with a value of not less than R-20 plus continuous insulation with a value of not less than R-5 (alternatively, cavity insulation can be R-13 when the continuous insulation is R-10). Continuous insulation refers to rigid foam plastic insulation that covers the wall framing and cavities so there is no thermal gap at the studs and plates as there is with cavity insulation. Where structural sheathing covers an area not greater than 40 percent of the gross area of exterior walls, the rating of the continuous foam plastic insulation can be reduced by as much as R-3. This means that a cavity insulation of R-20 plus continuous insulation of R-2 (R-5 – R-3 5 R-2) at the locations having structural sheathing satisfies the code requirement.

Justification: Approved through the ANSI process at the national code development hearings.

N1102.2.7 (R402.2.7) Floors. Floor insulation shall be installed to maintain permanent contact with the underside of the subfloor decking.

~~N1102.2.7~~ N1102.2.8 (R402.2.8) Floors. Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of the subfloor decking.

Exception: The floor framing cavity insulation shall be permitted to be in contact with the topside of sheathing or continuous insulation installed on the bottom side of floor framing where combined with insulation that meets or exceeds the minimum wood frame wall R-value in Table N1102.1.2 and that extends from the bottom to the top of all perimeter floor framing members.

City of Houston Amendment

Analysis: ***Modification*** – The code now permits an air space above required insulation installed in a floor framing cavity above unconditioned space. Table N1102.4.1.1 has been reformatted into three columns to separate the air barrier requirements from the insulation requirements.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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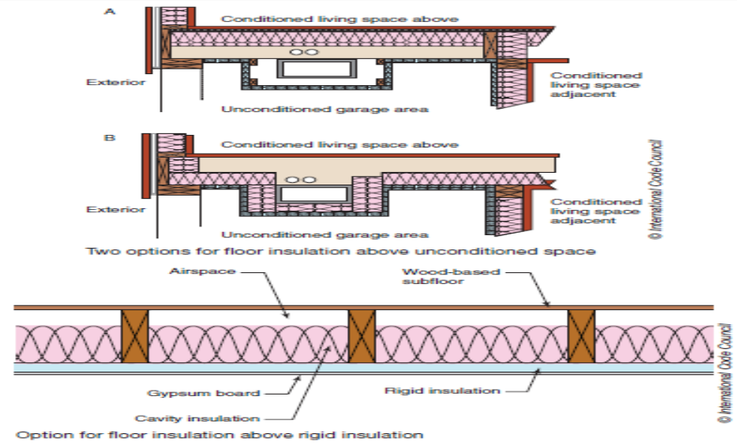
TABLE N1102.4.1.1 (R402.4.1.1)
AIR BARRIER AND INSULATION INSTALLATION

COMPONENT	CRITERIA[a]
Air barrier and thermal 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 shall be sealed. Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling/soffit shall be aligned with the insulation and any gaps in the air barrier sealed. Access openings, drop down stair or knee wall doors to unconditioned attic spaces shall be sealed.
Walls	Corners and headers shall be insulated and the junction of the foundation and sill plate 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 installed in substantial contact and continuous alignment with the air barrier. Knee walls shall be sealed.
Windows, skylights and doors	The space between window/door jambs and framing and skylights and framing shall be sealed.
Rim joists	Rim joists shall be insulated and include the air barrier.
Floors (including above-garage and cantilevered floors)	Insulation shall be installed to maintain permanent contact with underside of subfloor decking. The air barrier shall be installed at any exposed edge of insulation.

TABLE N1102.4.1.1 (402.4.1.1) Air Barrier and Insulation Installation

Component	Air Barrier Criteria	Insulation Installation Criteria
Floors (including above garage and cantilevered floors)	The air barrier shall be installed at any exposed edge of insulation	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking, or floor framing cavity insulation shall be permitted to be in contact with the topside of sheathing, or continuous insulation installed on the underside of floor framing; and extends from the bottom to the top of all perimeter floor framing members.

(Portions of table not shown for brevity and clarity.)



Change Significance: *Previously, the code required insulation that was installed in a floor framing cavity to be in contact with the underside of the floor sheathing. The code still permits that as one option but adds another option to have an air space between the floor sheathing and the top of the cavity insulation. In this case, the cavity insulation is in direct contact with the topside of the sheathing or continuous insulation installed on the underside of the floor framing and is combined with perimeter insulation that meets or exceeds the R-value requirements for walls. This second option leads to fewer cold spots and does not increase heat loss. It also facilitates ductwork, piping and wiring to be enclosed within the thermal envelope.*

Previously, Table N1102.4.1.1 contained only two columns. The first column described the component of construction under consideration and the second column prescribed both the air barrier and insulation installation criteria. The 2015 IRC reformats the table to place the air barrier and insulation requirements in separate columns. The reformatting does not change the technical requirements but intends to clarify the application of the table and reduce confusion by code users.

Justification: Approved through the ANSI process at the national code development hearings.

TABLE N1102.4.1.1 (R402.4.1.1)
AIR BARRIER AND INSULATION INSTALLATION

COMPONENT	CRITERIA[a]
Air barrier and thermal 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 shall be sealed. Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling/soffit shall be aligned with the insulation and any gaps in the air barrier sealed. Access openings, drop down stair or knee wall doors to unconditioned attic spaces shall be sealed.
Walls	Corners and headers shall be insulated and the junction of the foundation and sill plate 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 installed in substantial contact and continuous alignment with the air barrier. Knee walls shall be sealed.
	The space between window/door jambs and framing and skylights and framing shall be

TABLE N1102.4.1.1 (402.4.1.1) Air Barrier and Insulation Installation

Component	Air Barrier Criteria	Insulation Installation Criteria
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance of R-3 per inch minimum. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.

(Portions of table not shown for brevity and clarity.)

Table N1102.4.1.1 continues

City of Houston Amendment

Analysis: ***Clarification*** – Insulation requirements at framed wall corners and headers only apply when there is space to install insulation. The minimum insulation thermal resistance is R-3 per inch of insulation.

Change Significance: *The code is now more specific as to the required amount of insulation at framed wall corners and headers. The intent of the change is to clarify when insulation is required and the minimum thermal resistance value of the insulation. Proponents of this change reasoned that some headers and wall corners are solid, and there is no air space within which to install insulation. In this case, the code does not intend that insulation be installed or that the solid header or solid corner must meet a certain R-value. For example, a two-ply header of nominal 2-inch-thick lumber with a continuous ½-inch wood structural panel sandwiched between the 23 members measures 3½ inches in thickness and is the same thickness as a 2 3 4 wall. In this case, no insulation is required. When space is available, insulation must be installed. The code requires a minimum thermal resistance of R-3 per inch. Most insulation, including fiberglass and rigid foam plastic, meets or exceeds the value of R-3 per inch.*

Justification: Approved through the ANSI process at the national code development hearings.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
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	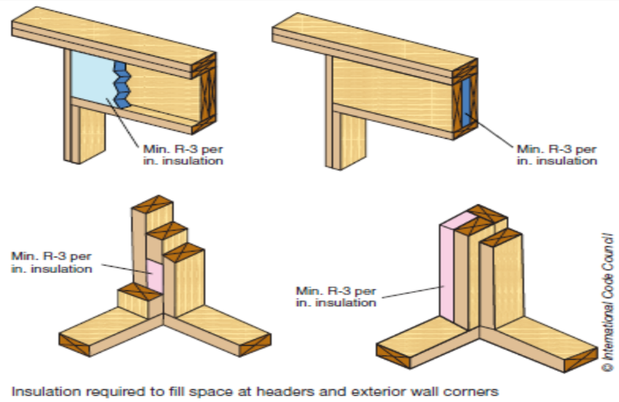 Insulation required to fill space at headers and exterior wall corners	
N1102.4.2 (R402.4.2) Fireplaces. New wood-burning fireplaces shall have tight-fitting flue dampers and outdoor combustion air.	**N1102.4.2 (R402.4.2) Fireplaces.** New wood-burning fireplaces shall have tight-fitting flue dampers or doors, and outdoor combustion air. Where using tight-fitting doors on factory-built fireplaces listed and labeled in accordance with UL 127, the doors shall be tested and listed for the fireplace. Where using tight-fitting doors on masonry fireplaces, the doors shall be listed and labeled in accordance with UL 907. **TABLE N1102.4.1.1 (R402.4.1.1) Air Barrier and Insulation Installation** Component / Air Barrier Criteria / Insulation Installation Criteria ~~Fireplace~~ / ~~An air barrier shall be installed on fireplace walls. Fireplaces shall have gasketed doors.~~ *(Portions of table not shown for brevity and clarity.)*  Fireplace doors must be listed for the application.	***City of Houston Amendment*** **Analysis:** ***Modification –*** Doors on wood-burning fireplaces must be listed for the application. The requirement for gasketed doors on fireplaces has been removed. *Change Significance: Fireplaces can potentially be major sources of air leakage because of the natural drafting of the chimney. The provisions for doors and dampers on fireplaces intend to reduce air leakage when the fireplace is not in use and improve energy efficiency. In previous code editions, Section N1102.4.2 has required a tight-fitting damper on new wood-burning fireplaces. The general insulation and air barrier requirements in Table N1102.4.1.1 required all fireplaces to have gasketed doors. The combination of a tight-fitting damper, gasketed door, and outdoor combustion air introduced directly into the firebox greatly improves the energy efficiency of this popular feature of homes. However, most factory-built fireplaces are not listed for use with gasketed doors. Factory-built fireplaces must be tested, listed, and labeled in accordance with UL 127 and installed in accordance with the conditions of the listing per IRC Section R1004. Installing a gasketed door that was not listed for use on a factory-built fireplace would be a violation of the listing and could cause a safety hazard if the door was closed while a fire was burning. The requirement for a gasketed door in Table N1102.4.1.1 has been removed and a requirement for a door on all new wood-burning fireplaces has been added to Section N1102.4.2. The code now stipulates that tight-fitting door installed on wood-burning fireplaces must be listed to the applicable standard.* **Justification:** Approved through the ANSI process at the national code development hearings.
N1103.2 (R403.2) Ducts. Ducts and air handlers shall be in accordance with Sections N1103.2.1 through N1103.2.3. **N1103.2.1 (R403.2.1) Insulation (Prescriptive).** Supply ducts in attics shall be insulated to a minimum of R-8. All other ducts shall be insulated to a minimum of R-6. **Exception:** Ducts or portions thereof located completely inside the *building thermal envelope.* **N1103.2.2 (R403.2.2) Sealing (Mandatory).** Ducts, air handlers, and filter boxes shall be sealed. Joints and seams shall comply with either the	**N1103.3 (R403.3) Ducts.** Ducts and air handlers shall be in accordance with Sections N1103.3.1 through N1103.3.5. **N1103.3.1 (R403.3.1) Insulation (Prescriptive).** Supply and return ducts in attics shall be insulated to a minimum of R-8 where 3 inches (76.2 mm) in diameter and greater and R-6 where less than 3 inches (76.2 mm) in diameter. Supply and return ducts in other portions of the building shall be insulated to a minimum of R-6 where 3 inches (76.2 mm) in diameter or greater and R-4.2 where less than 3 inches (76.2 mm) in diameter.	***City of Houston Amendment*** **Analysis:** Modification – The duct sealing and testing provisions have been reorganized to clarify the application. The maximum duct leakage rates are now prescriptive rather than mandatory provisions to accommodate design flexibility.

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International Mechanical Code or Section M1601.4.1 of this 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:

1. Postconstruction test: Total leakage shall be less than or equal to 4 cfm (113.3 L/min) per 100 square feet (9.29 m2) 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 4 cfm (113.3 L/min) per 100 ft2 (9.29 m2) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the system, including 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 3 cfm (85 L/min) per 100 square feet (9.29 m2) of conditioned floor area.

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

N1103.2.2.1 (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.

N1103.2.3 (R403.2.3) Building cavities (Mandatory). Building framing cavities shall not be used as ducts or plenums.

Exception: Ducts or portions thereof located completely inside the *building thermal envelope.*

N1103.3.2 (R403.3.2) Sealing (Mandatory). Ducts, air handlers and filter boxes shall be sealed. Joints and seams shall comply with either the *International Mechanical Code* or Section M1601.4.1 of this code, as applicable.

Exceptions:

1. Air-impermeable spray foam products shall be permitted to be applied without additional joint seals.
2. For ducts having a static pressure classification of less than 2 inches of water column (500 Pa), additional closure systems shall not be required for continuously welded joints and seams and locking-type joints and seams of other than the snap-lock and button-lock types.

N1103.3.2.1 (R403.3.2.1) 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.

N1103.3.3 (R403.3.3) Duct testing (Mandatory). Ducts shall be pressure tested to determine air leakage by one of the following methods:

1. **Rough-in test:** Total leakage shall be measured with a pressure differential of 0.1-inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. All registers shall be taped or otherwise sealed during the test.
2. **Postconstruction test:** Total leakage shall be measured with a pressure differential of 0.1-inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Registers shall be taped or otherwise sealed during the test.

Exception: A duct air leakage test shall not be required where the ducts and air handlers are located entirely within the building thermal envelope.

A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*.

N1103.3.4 (R403.3.4) Duct leakage (Prescriptive). The total leakage of the ducts, where measured in accordance with Section R403.3.3, shall be as follows:

1. **Rough-in test:** The total leakage shall be less than or equal to 4 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m^2) of conditioned floor area where the air handler is installed at the time of the test. Where the air handler is not installed at the time of the test, the total leakage shall be less than or equal to 3 cubic feet per minute (85 L/min) per 100 square feet (9.29 m^2) of conditioned floor area.
2. **Postconstruction test:** The total leakage shall be less than or equal to 4 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m^2) of conditioned floor area.

N1103.3.5 (R403.3.5) Building cavities (Mandatory). Building framing cavities shall not be used as ducts or plenums.

(Portions of Section N1103.3 are not shown for brevity and clarity.)

Duct seal-mastic

Change Significance: The changes to Section N1103.3 regarding ducts are largely editorial and a reorganization to improve understanding and application of the provisions. The significant change places the duct pressure testing methods and the maximum air-leakage rates in separate sections. The requirements for testing and the testing methods utilized remain as mandatory provisions. The limits on air leakage are now prescriptive provisions rather than mandatory. This means that alternative performance measures may be used to provide equivalency in satisfying the code requirements for air-leakage rates. This flexibility is particularly important in the case of an unexpected test failure where the air-leakage rate exceeded the limits of Section N1103.3.4.

Justification: Approved through the ANSI process at the national code development hearings.

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N1103.4 (R403.4) Service hot water systems. Energy conservation measures for service hot water systems shall be in accordance with Sections N1103.4.1 and N1103.4.2.

N1103.4.1 (R403.4.1) Circulating hot water systems (Mandatory). Circulating hot water systems shall be provided with an automatic or readily *accessible* manual switch that can turn off the hot water circulating pump when the system is not in use.

N1103.4.2 (R403.4.2) Hot water pipe insulation (Prescriptive). Insulation for hot water pipe with a minimum thermal resistance (*R*-value) of R-3 shall be applied to the following:

1. Piping larger than 3/4-inch nominal diameter.
2. Piping serving more than one dwelling unit.
3. Piping from the water heater to kitchen outlets.
4. Piping located outside the conditioned space.
5. Piping from the water heater to a distribution manifold.
6. Piping located under a floor slab.
7. Buried piping.
8. Supply and return piping in recirculation systems other than demand recirculation systems.
9. Piping with run lengths greater than the maximum run lengths for the nominal pipe diameter given in Table N1103.4.2.

All remaining piping shall be insulated to at least R-3 or meet the run length requirements of Table N1103.4.2.

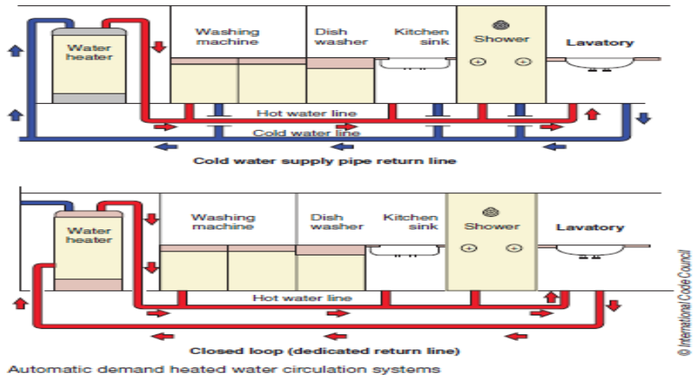
N1103.5 (R403.5) Service hot water systems. Energy conservation measures for service hot water systems shall be in accordance with Sections N1103.5.1 and N1103.5.4.

N1103.5.1 (R403.5.1) Heated water circulation and temperature maintenance systems (Mandatory). Heated water circulation systems shall be in accordance with Section R1103.5.1.1. Heat trace temperature maintenance systems shall be in accordance with Section R1103.5.1.2. Automatic controls, temperature sensors and pumps shall be accessible. Manual controls shall be readily *accessible*.

N1103.5.1.1 (R403.5.1.1) Circulation systems. Heated water circulation systems shall be provided with a circulation pump. The system return pipe shall be a dedicated return pipe or a cold-water supply pipe. Gravity and thermo-syphon circulation systems shall be prohibited. Controls for circulating hot water system pumps shall start the pump based on the identification of a demand for hot water within the occupancy. The controls shall automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is no demand for hot water.

N1103.5.1.2 (R403.5.1.2) Heat trace systems. Electric heat trace systems shall comply with IEEE 515.1 or UL 515. Controls for such systems shall automatically adjust the energy input to the heat tracing to maintain the desired water temperature in the piping in accordance with the times when heated water is used in the occupancy.

(Portions of Section N1103.5 are not shown for brevity and clarity.)



Automatic demand heated water circulation systems

City of Houston Amendment

Analysis: ***Modification*** – The code now requires automatic controls to maintain hot water temperature for heated water circulation systems and for heat trace temperature maintenance systems when such systems are installed. To save energy, continuously operating circulation pumps are no longer permitted. Heat trace systems must comply with one of the referenced standards.

Change Significance: Service water heating supplies hot water to the dwelling unit for purposes other than comfort heating. This is the dwelling's hot water supply for bathing, washing, kitchen sink, laundry, and similar uses. Heated water circulation and temperature maintenance systems are not required, but when installed they must meet the mandatory requirements of Section N1103.5. These systems use circulation pumps or heat trace components to maintain the desired temperature of hot water for the convenience of the user and to conserve water that would otherwise be drawn until hot water reached the fixture outlet. The previous language only addressed circulation systems, not heat trace temperature maintenance systems, and only required an automatic switch or a readily accessible manual switch to turn off the circulating pump when the system was not in use. In addition, the language permitted a continuously operating circulation pump, which is not the most energy-efficient system. There have been no provisions for the more efficient demand-activated circulation systems. There also was no requirement that heat trace components be suitable for the application.

The new provisions in Section N1103.5 do not permit a continuously operating circulating pump. The pump must operate on automatic controls activated when the hot water in the system falls below the desired temperature or when there is a demand for hot water. Pipe insulation is required for hot water circulation systems and the water in the circulation piping can stay hot for an extended time depending on the diameter of the piping. Because the pump only operates intermittently when needed, demand-activated circulation is significantly more energy efficient than a continuously operating heated water circulation system.

A heat trace system is the other energy-efficient means for maintaining the desired temperature in the service hot water system. The code requires heat trace systems to comply with one of the referenced standards and to have automatic controls to conserve energy. As with circulation systems, piping in a heat trace system requires pipe insulation.

Justification: Approved through the ANSI process at the national code development hearings.

2012 Houston IRC – Part 5— Chapters 12 through 23 Mechanical	2015 Houston IRC C – Part 5—Chapters 12 through 23 Mechanical	Code Analysis

Part 5—Chapters 12 through 23 [RE] Mechanical

■ Chapter 12 Mechanical Administration-No changes addressed; ■ Chapter 13 General Mechanical System Requirements-No changes addressed; ■ Chapter 14 Heating and Cooling Equipment-No changes addressed; ■ Chapter 15 Exhaust Systems; ■ Chapter 16 Duct Systems; ■ Chapter 17 Combustion Air-No changes addressed; ■ Chapter 18 Chimneys and Vents No changes addressed; ■ Chapter 19 Special Appliances, Equipment and Systems-No changes addressed; ■ Chapter 20 Boilers and Water Heaters-No changes addressed; ■ Chapter 21 Hydronic Piping No changes addressed; ■ Chapter 22 Special Piping and Storage Systems-No changes addressed; ■ Chapter 23 Solar Systems-No changes addressed

As a comprehensive code that applies to all aspects of residential construction, the IRC contains provisions for the mechanical, fuel gas, plumbing and electrical systems of the building. These systems are covered in their respective parts of the IRC beginning with Part 5. This part contains administrative provisions unique to the application and enforcement of regulations governing mechanical systems, as well as the technical provisions related to system design and installation. Chapter 13 provides the general requirements for all mechanical systems and addresses the listing and labeling of appliances, types of fuel used, access to appliances, clearance to combustibles and other related issues. The remainder of Part 5 deals with requirements for specific mechanical systems related to heating and cooling, exhaust, ventilation, ducts, vents, boilers and hydronic piping. The last two chapters of Part 5 contain provisions specific to fuel oil piping and storage, and solar energy systems. ■.

M1502.4.4, M1502.4.5-Dryer Exhaust Duct Power Ventilators; M1502.4.6-Dryer Duct Length Identification; M1503.4-Makeup Air for Range Hoods; M1506.2-Exhaust Duct Length; M1601.1.1, TABLE M1601.1.1, M1601.2-Above-Ground Duct Systems; M1601.4-Duct Installation; M1602-Return Air

2012 Houston IRC – Chapter 12 Mechanical Administration	2015 Houston IRC – Chapter 12 Mechanical Administration	Code Analysis

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
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1201.1 Scope. The provisions of Chapters 12 through 24 shall regulate the design, installation, maintenance, *alteration,* and inspection of mechanical systems that are permanently installed and used to control environmental conditions within buildings. These chapters shall also regulate those mechanical systems, system components, *equipment* and *appliances* specifically addressed in this code. The administrative provisions of the *Mechanical Code* shall govern Chapters 12 through 23 and the mechanical provisions of Chapter 24.	**M1201.2 Application.** In addition to the general administration requirements of Chapter 1, the administrative provisions of ~~this chapter~~ the *Mechanical Code* shall also apply to the mechanical requirements of Chapters ~~13 through~~ ~~24~~ 12 through 23, as well as to the mechanical provisions of Chapter 24.	***City of Houston Amendment*** **Analysis:** The previous IRC 2012 COH amendment to Section 1201.1 is relocated to IRC Section M1201.2. ***No changes to the previous code requirements or code intent.*** **Justification:** This amendment was relocated from M1201.1.
M1202.3 Maintenance. Mechanical systems, both existing and new, and parts thereof shall be maintained in proper operating condition in accordance with the original design and in a safe and sanitary condition. Devices or safeguards that are required by this code shall be maintained in compliance with the code edition under which installed. The owner or the owner's designated agent shall be responsible for maintenance of the mechanical systems. ~~To determine compliance with this provision, the *building official* shall have the authority to require a mechanical system to be reinspected.~~	**M1202.3 Maintenance.** Mechanical systems, both existing and new, and parts thereof shall be maintained in proper operating condition in accordance with the original design and in a safe and sanitary condition. Devices or safeguards that are required by this code shall be maintained in compliance with the code edition under which installed. The owner or the owner's designated agent shall be responsible for maintenance of the mechanical systems. To determine compliance with this provision, the *building official* shall have the authority to require a mechanical system to be reinspected.	***City of Houston Amendment*** **Analysis:** The COH amendment was omitted. ***No changes to the previous code requirements or code intent.*** **Justification:** The amendment is omitted as it unjustifiably restricts the authority of the Building Official and inspectors to require reinspection where circumstances or complaints indicate the system is not operating as designed or intended and requires correction for code compliance with the code of record.
2012 Houston IRC – Chapter 13 General Mechanical System Requirements	**2015 Houston IRC – Chapter 13 General Mechanical System Requirements**	**Code Analysis**
M1305.1.3 Appliances in attics. *Attics* containing *appliances* shall be provided with pull down stair large enough to allow removal of the largest appliance and not less than 22 inches in width with a load capacity of not less than 350 pounds ~~an opening~~ and a clear and unobstructed passageway large enough to allow removal of the largest *appliance,* but not less than 30 inches (762 mm) high and ~~22 inches (559 mm)~~ 30 inches (762 mm) wide and not more than 20 feet (6096 mm) long measured along the centerline of the passageway from the opening to the *appliance.* The passageway shall have continuous solid flooring in accordance with Chapter 5 not less than 24 inches (610 mm) wide. A level service space at least 30 inches (762 mm) deep and 30 inches (762 mm) wide shall be present along all sides of the *appliance* where access is required. The clear access opening dimensions shall be a minimum of 20 inches by 30 inches (508 mm by 762 mm), and large enough to allow removal of the largest appliance. **Exceptions:** **1.** The passageway and level service space are not required where the *appliance* can be serviced and removed through the required opening. **2.** Where the passageway is unobstructed and not less than 6 feet (1829 mm) high and 22 inches (559 mm) wide for its entire length, the passageway shall be not more than 50 feet (15,250 mm) long. **3.** The opening is through a vertical door on the same level as the equipment with a minimum clear access opening of 30 inches (762 mm) high and 22 inches (559 mm) wide and large enough to allow removal of the largest appliance.	**M1305.1.3 Appliances in attics.** *Attics* containing *appliances,* shall be provided with pull down stairs large enough to allow removal of the largest appliance and not less than 22 inches in width at its narrowest point with a load capacity of not less than 350 pounds ~~an opening~~ and a clear and unobstructed passageway large enough to allow removal of the largest *appliance,* but not less than 30 inches (762 mm) high and ~~22~~ 30 inches (~~559~~ 762 mm) wide and not more than 20 feet (6,096 mm) long measured along the centerline of the passageway from the opening to the *appliance*. The passageway shall have continuous solid flooring in accordance with Chapter 5 not less than 24 inches (610 mm) wide. A level service space not less than 30 inches (762 mm) deep and 30 inches (762 mm) wide shall be present along all sides of the *appliance* where access is required. The clear access opening dimensions shall be not less than 20 inches by 30 inches (508 mm by 762 mm), and large enough to allow removal of the largest *appliance*. **Exceptions:** **1.** The passageway and level service space are not required where the *appliance* can be serviced and removed through the required opening. **2.** Where the passageway is unobstructed and not less than 6 feet (1,829 mm) high and 22 inches (559 mm) wide for its entire length, the passageway shall be not more than 50 feet (15,250 mm) long. **3.** The opening is through a vertical door on the same level as the equipment with a minimum clear access opening of 30 inches (762 mm) high and 22 inches (559 mm) wide and large enough to allow removal of the largest appliance.	***City of Houston Amendment*** **Analysis:** At the request of field inspectors and contractors the previous IRC 2012 COH amendment includes minor editorial changes for additional clarity in the IRC 2015 provisions of Section M1305.1.3. ***No changes to the previous code requirements or code intent.*** **Justification:** The existing amendment has been reorganized and rewritten to clarify the language and intent.
M1305.1.4 Appliances under floors. Underfloor spaces containing *appliances* shall be provided with an unobstructed passageway large enough to remove the largest appliance, but not less than 30 inches (762 mm) high and ~~22 inches (559 mm)~~ 30 inches (762 mm) wide, nor more than 20 feet (6096 mm) long measured along the centerline of the passageway from the opening	**M1305.1.4 Appliances under floors.** Underfloor spaces containing *appliances* shall be provided with an unobstructed passageway large enough to remove the largest *appliance*, but not less than 30 inches (762 mm) high and 22 inches (559 mm) wide, nor more than 20 feet (6096 mm) long measured along the centerline of the passageway from the opening to the *appliance*. A	***City of Houston Amendment*** **Analysis:** The previous COH amendment has been omitted so that the measurements will correlate with the provisions specified in other volume of the Houston Construction Code. (UMC).

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
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to the *appliance*. A level service space at least 30 inches (762 mm) deep and 30 inches (762 mm) wide shall be present at the front or service side of the *appliance*. If the depth of the passageway or the service space exceeds 12 inches (305 mm) below the adjoining grade, the walls of the passageway shall be lined with concrete or masonry extending 4 inches (102 mm) above the adjoining grade in accordance with Chapter 4. The rough-framed access opening dimensions shall be a minimum of ~~22 inches~~30 inches (762 mm) by 30 inches (~~559 mm by~~ 762 mm), and large enough to remove the largest appliance. **Exceptions:** **1.** The passageway is not required where the level service space is present when the access is open, and the *appliance* can be serviced and removed through the required opening. **2.** Where the passageway is unobstructed and not less than 6 feet high (1929 mm) and 22 inches (559 mm) wide for its entire length, the passageway shall not be limited in length.	level service space not less than 30 inches (762 mm) deep and 30 inches (762 mm) wide shall be present at the front or service side of the *appliance*. If the depth of the passageway or the service space exceeds 12 inches (305 mm) below the adjoining grade, the walls of the passageway shall be lined with concrete or masonry extending 4 inches (102 mm) above the adjoining grade in accordance with Chapter 4. The rough-framed access opening dimensions shall be not less than 22 inches by 30 inches (559 mm by 762 mm), and large enough to remove the largest *appliance*. **Exceptions:** **1.** The passageway is not required where the level service space is present when the access is open, and the *appliance* can be serviced and removed through the required opening. **2.** Where the passageway is unobstructed and not less than 6 feet high (1929 mm) and 22 inches (559 mm) wide for its entire length, the passageway shall not be limited in length.	**Justification:** No justification for changing dimensions, will now correlate with code provisions specified in the Uniform Mechanical Code.
M1305.1.4.3 Electrical requirements. A luminaire controlled by a switch located at the required passageway opening and a receptacle outlet shall be installed at or near the *appliance* location in accordance with the *Electrical Code* ~~Chapter 39~~.	**M1305.1.4.3 Electrical requirements.** A luminaire controlled by a switch located at the required passageway opening and a receptacle outlet shall be installed at or near the *appliance* location in accordance with the *Electrical Code* ~~Chapter 39~~. Exposed lamps shall be protected from damage by location or lamp guards.	***City of Houston Amendment*** **Analysis:** ***No changes to the previous code requirements or code intent.*** **Justification:** This amendment is necessary to reference the applicable code for electrical requirements.
M1307.4.2 Mechanical ventilation. Indoor locations intended for hydrogen-generating or refueling operations shall be ventilated in accordance with Section 502.16 of the *International Mechanical Code*. In these locations, *equipment* and *appliances* having an *ignition source* shall be located so that the source of ignition is below the mechanical *ventilation* outlet(s).	**M1307.4.2 Mechanical *ventilation*.** Indoor locations intended for hydrogen-generating or refueling operations shall be ventilated in accordance with Section ~~502.16 of the *International Mechanical Code*~~ 406.9 of the *Building Code*. In these locations, *equipment* and *appliances* having an *ignition source* shall be located so that the source of ignition is below the mechanical *ventilation* outlet(s).	***City of Houston Amendment*** **Analysis:** A COH amendment was added as a pointer to correlate with applicable requirements in other volumes of the *Houston Construction Code*. ***No changes to the previous code requirements or code intent.*** **Justification:** This amendment is necessary to reference the appropriate section and code for the requirements of this section.
M1308.2 Protection against physical damage. In concealed locations where piping, other than cast-iron or galvanized steel, is installed through holes or notches in studs, joists, rafters, or similar members less than 1.5 inches (38 mm) from the nearest edge of the member, the pipe shall be protected by shield plates. Protective steel shield plates having a minimum thickness of 0.0575-inch (1.463 mm) (No. 16 gage), shall cover the area of the pipe where the member is notched or bored, and shall extend a minimum of 2 inches (51 mm) above sole plates and below top plates.	**M1308.2 Protection against physical damage.** Where piping will be concealed within light-frame construction assemblies, the piping shall be protected against penetration by fasteners in accordance with Sections M1308.2.1 through M1308.2.3. **Exception:** Cast iron piping, black steel pipe, and galvanized steel piping shall not be required to be protected.	***City of Houston Amendment*** **Analysis:** A COH amendment was added to correlate with industry terminology and for clarity. **Justification:** Legal readded this previous amendment per 10-12-2021 blackline file.
2012 Houston IRC – Chapter 14 Heating and Cooling Equipment and Appliances	**2015 Houston IRC – Chapter 14 Heating and Cooling Equipment and Appliances**	**Code Analysis**
M1401.2 Access. Heating and cooling *equipment* and appliances shall be located with respect to building construction and other *equipment* and appliances to permit maintenance, servicing, and replacement. Clearances shall be maintained to permit cleaning of heating and cooling surfaces; replacement of filters, blowers, motors, controls, and vent connections; lubrication of moving parts; and adjustments. A level service space at least 30 inches (762 mm) deep and 30 inches (762 mm) wide shall be present along all sides of the appliance where access is required. **Exception:** Access shall not be required for ducts, piping, or other components approved for concealment.	**M1401.2 Access.** Heating and cooling *equipment* and appliances shall be located with respect to building construction and other *equipment* and appliances to permit maintenance, servicing, and replacement. Clearances shall be maintained to permit cleaning of heating and cooling surfaces; replacement of filters, blowers, motors, controls, and vent connections; lubrication of moving parts; and adjustments. A level service space at least 30 inches (762 mm) deep and 30 inches (762 mm) wide shall be present along all sides of the *appliance* where access is required. **Exception:** Access shall not be required for ducts, piping, or other components approved for concealment.	***City of Houston Amendment*** **Analysis:** ***No changes to the previous code requirements or code intent.*** **Justification:** This amendment is necessary to ensure the safety and comfort of personnel that access the heating and cooling equipment and appliances referenced in this code.

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M1411.3 Condensate disposal. Condensate from all cooling coils or evaporators shall be conveyed from the drain pan outlet to an *approved plumbing fixture or* ~~place of~~ disposal area. Such piping shall maintain a minimum horizontal slope in the direction of discharge of not less than ⅛ unit vertical in 12 units horizontal (1-percent slope). Condensate shall not discharge into a street, alley, or other areas where it would cause a nuisance. Drain pans and coils shall be arranged to allow thorough drainage and access for cleaning. Primary drain piping inside buildings shall be insulated for the first 15 feet horizontally from the drain pan.	**M1411.3 Condensate disposal.** Condensate from all cooling coils ~~or~~ and evaporators shall be conveyed from the drain pan outlet to an *approved plumbing fixture* or ~~place of~~ disposal area. Such piping shall maintain a minimum horizontal slope in direction of discharge of not less than 1/8-unit vertical in 12 units horizontal (1-percent slope). Condensate shall not discharge into a street, alley, or other areas where it would cause a nuisance. Drain pans and coils shall be arranged to allow thorough drainage and access for cleaning. Primary drain piping inside buildings shall be insulated for the first 15 feet horizontally from the drain pan.	***City of Houston Amendment*** **Analysis:** Minor editorial changes to the previous COH amendment. ***No changes to the previous code requirements or code intent.*** **Justification:** This amendment is necessary to ensure that drainpipes and coils are arranged in a manner that will facilitate drainage and cleaning. Insulation requirements are added to reflect local conditions.

2012 Houston IRC – Chapter 15 Exhaust Systems	2015 Houston IRC – Chapter 15 Exhaust Systems	Code Analysis
M1502.4.4.1 Specified length. The maximum length of the exhaust duct shall be 35 feet (10 668 mm) from the connection to the transition duct from the dryer to the outlet terminal. Where fittings are used, the maximum length of the exhaust duct shall be reduced in accordance with Table M1502.4.4.1. The maximum length of the exhaust duct does not include the transition duct. **Exception:** Listed booster fans installed per manufacturer's specifications may be provided to extend the maximum length of exhaust duct. **M1502.4.4.2 Manufacturer's instructions.** The size and maximum length of the exhaust duct shall be determined by the dryer manufacturer's installation instructions. The code official shall be provided with a copy of the installation instructions for the make and model of the dryer at the concealment inspection. In the absence of fitting equivalent length calculations from the clothes dryer manufacturer, Table M1502.4.4.1 shall be used.	**M1502.4.4 Dryer exhaust duct power ventilators.** Domestic dryer exhaust duct power ventilators shall conform to UL 705 for use in dryer exhaust duct systems. The dryer exhaust duct power ventilator shall be installed in accordance with the manufacturer's instructions. **M1502.4.5 Duct length.** The maximum allowable exhaust duct length shall be determined by one of the methods specified in Sections M1502.4.5.1 through M1502.4.5.3. **M1502.4.5.1 Specified length.** The maximum length of the exhaust duct shall be 35 feet (10,668 mm) from the connection to the transition duct from the dryer to the outlet terminal. Where fittings are used, the maximum length of the exhaust duct shall be reduced in accordance with Table M1502.4.5.1. The maximum length of the exhaust duct does not include the transition duct. **M1502.4.5.2 Manufacturer's instructions.** The size and maximum length of the exhaust duct shall be determined by the dryer manufacturer's installation instructions. The code official shall be provided with a copy of the installation instructions for the make and model of the dryer at the concealment inspection. In the absence of fitting equivalent length calculations from the clothes dryer manufacturer, Table M1502.4.4.1 shall be used. **M1502.4.5.3 Dryer exhaust duct power ventilator.** The maximum length of the exhaust duct shall be determined in accordance with the manufacturer's instructions for the dryer exhaust duct power ventilator.  Dryer exhaust duct power ventilator (DEDPV)	***City of Houston Amendment*** **Analysis:** The previous COH amendment exception to the maximum duct length is omitted as the IRC 2015 model code includes code provisions that address dryer exhaust duct power ventilators. The code now recognizes the use of dryer exhaust duct power ventilators (DEDPVs) to increase the allowable exhaust duct length for clothes dryers. ***No changes to the previous code requirements or code intent.*** *CHANGE SIGNIFICANCE: The code limits the length of clothes dryer exhaust ducts to protect against potential fire hazards and to ensure that dryers efficiently discharge warm, moist air to the outdoors. Allowable length is based on the airflow capacity of modern dryers. Elbow fittings reduce the allowable length, resulting in a calculated "equivalent length" based on the additional resistance to airflow for each fitting. In addition to lint buildup, excessive duct length creates moisture and maintenance problems and increases drying times causing the dryer to be inefficient and waste energy.* *Previous editions of the code did not recognize dryer exhaust duct power ventilators (DEDPVs) as an option for clothes dryer installations. DEDPVs are typically referred to as "dryer booster fans" in the marketplace, because they "boost" or increase the airflow of the dryer discharge. Greater airflow increases the distance that the discharge air can be effectively pushed to the outdoors. Prior to the 2015 IRC, the two options for determining the maximum exhaust duct length were to comply with the prescriptive limit of 35 feet, a conservative average for modern dryers, or to follow the clothes dryer manufacturer's instructions for length limits. If the desired location did not fall within those limits, the designer or builder was left to relocate the dryer to reduce the length of the exhaust duct. Another possible solution was to make application to the building official requesting approval to install a DEDPV under the alternative materials, design, and methods of construction provisions in Section R104.11. The 2015 IRC now specifically allows DEDPVs in clothes dryer exhaust systems to increase the equivalent length of duct.* *DEDPVs are listed to a revised version of UL 705 that now contains tests and construction requirements that are specific to these devices. DEDPVs have been around for years, but until recently were not listed to a national consensus standard that was specific to these devices. The UL 705 standard contains requirements for the construction, testing and installation of DEDPVs and requires them to be equipped with features such as interlocks, limit controls, monitoring controls and enunciator devices to make certain that the dryers or dryer operators are aware of the operating status of the DEDPVs. The maximum length of the dryer exhaust duct is determined based on the manufacturer's instructions for the DEDPV.* **Justification:** The amendment is no longer technically justified or needed as new code provisions of M1502.4.4 addresses this issue.

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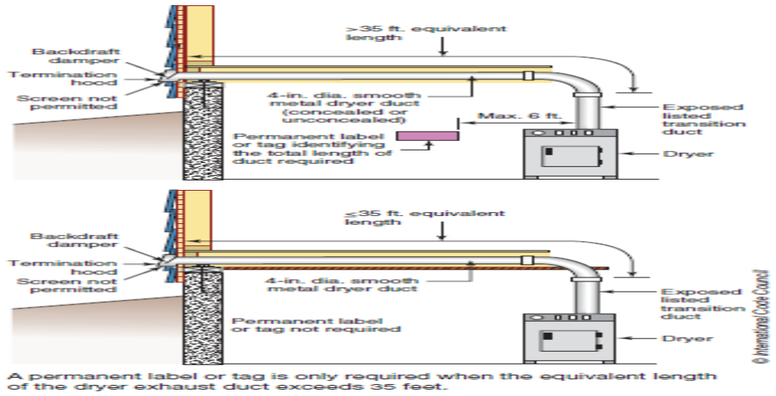
M1502.4.5 Length identification. Where the exhaust duct is concealed within the building construction, and overall length as specified in M1502.4.4.1 exceeds 35 feet (10,688 mm), the equivalent length of the exhaust duct shall be identified on a permanent label or tag. The label or tag shall be located within 6 feet (1,829 mm) of the exhaust duct connection.

M1502.4.6 Length identification. Where the exhaust duct equivalent length exceeds 35 feet (10,668 mm), the equivalent length of the exhaust duct shall be identified on a permanent label or tag. The label or tag shall be located within 6 feet (1,829 mm) of the exhaust duct connection.



A permanent label or tag is only required when the equivalent length of the dryer exhaust duct exceeds 35 feet.

City of Houston Amendment

Analysis: The previous COH amendment exception to the maximum duct length of 35 feet is omitted as the IRC 2015 model code includes code provisions that address dryer exhaust duct power ventilators. ***No changes to the previous code requirements or code intent.***

CHANGE SIGNIFICANCE: The provisions for identifying the equivalent length of dryer exhaust duct first appeared in the 2009 IRC. The code has since required a permanent label or tag installed within 6 feet of the dryer when the duct was concealed behind finish materials. The purpose was to alert occupants of the length of the concealed duct so they could make an informed decision to install a dryer with adequate airflow capacity. This provision recognizes that homes change hands, and many dryers may be installed over the building's lifetime. The primary concern was aimed at exhaust duct systems that were based on the dryer manufacturer's instructions at the time of construction. A given dryer might have a capacity much greater than the specified length of 35 feet, the default value when the manufacturer and model of the dryer is unknown. This change to the 2015 IRC recognizes that there is no concern if the exhaust duct does not exceed 35 feet in equivalent length and the permanent label in this case provides no benefit to the owner. In addition, the proponents reasoned that the purpose of the permanent sign is to notify the owners and installers that the dryer duct length is exceptional, and any installed dryer must be compatible with that duct of exceptional length. Therefore, the criterion for providing signage only when the duct is concealed has been removed. The code now requires a permanent label or tag when the equivalent length of the dryer exhaust duct exceeds 35 feet, whether the duct is concealed within construction.

Justification: This amendment is no longer needed due to changes in base code.

SECTION M1508
MAKE UP AIR

M1508.1 Make up air. When a closet is designed for the installation of a clothes dryer, a minimum opening of 100 square inches (1.0645 m^2) for makeup air shall be provided in the door or by other approved means.

SECTION M1502
CLOTHES DRYER EXHAUST

M1502.6 Make up air. When a closet is designed for the installation of a clothes dryer, a minimum opening of 100 square inches (1.0645 m^2) for makeup air shall be provided in the door or by other approved means.

City of Houston Amendment

Analysis: Previous COH amendment is retained to specifically address makeup air for dryer closets. COH amendment is relocated from IRC 2012 Section M1508.1 to IRC 2015 Section M1502.6 to correlate with IRC 2015 format. ***No changes to the previous code requirements or code intent.***

Justification: This amendment was relocated from 2012 Section M1508.1 to this more appropriate location.

M1503.2 Duct material. Single-wall ducts serving range hoods shall be constructed of galvanized steel, stainless steel, or copper.

Exception: Ducts for domestic kitchen cooking *appliances* equipped with down-draft exhaust systems shall be permitted to be constructed of schedule 40 PVC pipe and fittings provided that the installation complies with all the following:

1. The duct is installed under a concrete slab poured on grade;
2. The underfloor trench in which the duct is installed is completely backfilled with sand or gravel;
3. The PVC duct extends not more than 6 inches (152.4 mm) ~~1 inch (25 mm)~~ above the indoor concrete floor surface;
4. The PVC duct extends not more than 12 inches (304.8 mm) ~~1 inch (25 mm)~~ above grade *outside of the building*; and
5. The PVC ducts are solvent cemented.

M1503.2 Duct material. Ducts serving range hoods shall be constructed of galvanized steel, stainless steel or copper.

Exception: Ducts for domestic kitchen cooking *appliances* equipped with down-draft exhaust systems shall be permitted to be constructed of schedule 40 PVC pipe and fittings provided that the installation complies with all of the following:

1. The duct is installed under a concrete slab poured on grade.
2. The underfloor trench in which the duct is installed is completely backfilled with sand or gravel.
3. The PVC duct extends not more than 6 inches (152.4 mm) ~~1 inch (25 mm)~~ above the indoor concrete floor surface.
4. The PVC duct extends not more than 12 inches (304.8 mm) ~~1 inch (25 mm)~~ above grade *outside of the building.*
5. The PVC ducts are solvent cemented.

City of Houston Amendment

Analysis: No changes were made to the COH amendment. ***No changes to the previous code requirements or code intent.***

Justification: Amendment needed to correlate with the requirements of the Uniform Mechanical Code.

M1503.4 Makeup air required. Exhaust hood systems capable of exhausting in excess of 400 cubic feet per minute (0.19 m^3/s) shall be provided with makeup air at a rate approximately equal to the exhaust air rate. Such makeup air systems shall be equipped with a means of closure and shall be

M1503.4 Makeup air required. Exhaust hood systems capable of exhausting in excess of 400 cubic feet per minute (0.19 m^3/s) shall be mechanically or naturally provided with makeup air at a rate approximately equal to the exhaust air rate. Such makeup air systems shall be equipped with not less than one damper. Each damper shall be a gravity damper or an electrically operated damper that automatically opens when the exhaust system operates. Dampers

City of Houston Amendment

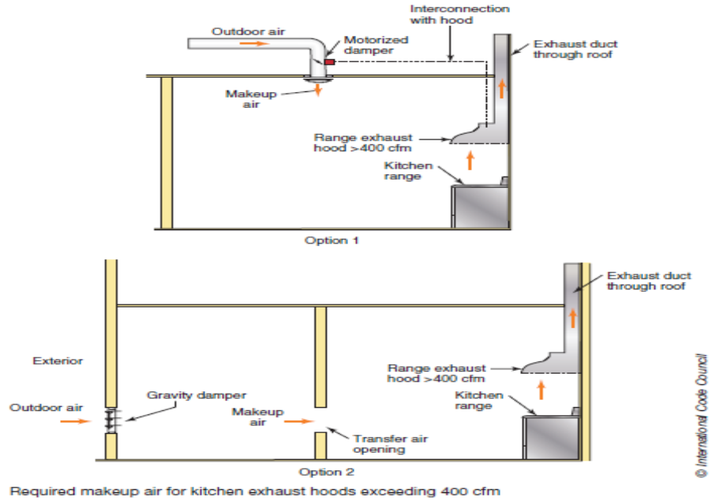
Analysis: ***Modification*** – Automatic operation of a mechanical damper is no longer required for supplying makeup air for kitchen exhaust systems exceeding a rating of 400 cubic feet per minute (cfm). Transfer openings are permitted to obtain makeup air from rooms other than the kitchen.

automatically controlled to start and operate simultaneously with the exhaust system.

M1503.4.1 Location – N/A

shall be accessible for inspection, service, repair, and replacement without removing permanent construction or any other ducts not connected to the damper being inspected, serviced, repaired, or replaced.

M1503.4.1 Location. Kitchen exhaust makeup air shall be discharged into the same room in which the exhaust system is located or into rooms or duct systems that communicate through one or more permanent openings with the room in which such exhaust system is located. Such permanent openings shall have a net cross-sectional area not less than the required area of the makeup air supply openings.



Required makeup air for kitchen exhaust hoods exceeding 400 cfm

CHANGE SIGNIFICANCE: The 2009 IRC introduced provisions for makeup air for high-velocity kitchen exhaust hoods that were capable of an airflow rate exceeding 400 cfm. Although this size of kitchen hood equipment is unusual in residential construction, the concern is that kitchens in modern homes are getting larger and oversized equipment is becoming more popular. With tighter building thermal envelopes for energy conservation, the high rate of exhaust requires outside makeup air to prevent negative pressure and the adverse effects on other appliances and systems. The code previously required an automatic damper that was interlocked with the exhaust hood so that outdoor makeup air was provided any time the hood fan was in operation.

The 2015 IRC provides more flexibility in achieving adequate makeup air for high-velocity kitchen exhaust fans. The outdoor makeup air can be obtained either mechanically or naturally. In either case, a damper is required to provide a means of closure, reduce air leakage, and conserve energy. Electrically operated dampers must still be interlocked to automatically open when the exhaust system operates. The other option is to provide a gravity damper that opens in response to pressure differentials created when the exhaust fan operates. The gravity damper is balanced to close when exhaust fan operation ceases. Proponents of this change offered that allowing a gravity damper is compatible with other similar applications in the IRC and that the residential code does not require automatic motorized dampers elsewhere. Proponents also stated that a gravity damper has the added benefit of equalizing depressurization in the house during the operation of other equipment such as bath fans and clothes dryers. Both types of dampers—gravity and motorized—require maintenance and may need to be replaced at some time. Therefore, the code requires the dampers to be accessible.

The code also clarifies that the source of makeup air may be from a room or space other than the kitchen where the range hood is located. When outdoor air is introduced into another room through a mechanical damper or gravity damper, permanent openings of adequate size are required between the rooms for the makeup air to pass though. This provision recognizes that homeowners have valid reasons for not wanting the opening in the kitchen. Locating the opening in another room or bringing the makeup air in through the duct system allows the unconditioned air to mix and temper. This is beneficial in both the heating and cooling seasons in various climate zones. Proponents of this change reasoned that requiring the outside air opening in the kitchen created the possibility that it would be covered or otherwise disabled due to the discomfort of introducing unconditioned air to the kitchen.

Justification: Approved through the ANSI process at the national code development hearings.

SECTION M1506
EXHAUST DUCTS AND EXHAUST OPENINGS

M1506.1 Ducts. Where exhaust duct construction is not specified in this chapter, construction shall comply with Chapter 16.

M1506.2 Exhaust openings. Air exhaust openings shall terminate not less than 3 feet (914 mm) from property lines; 3 feet (914 mm) from operable and nonoperable openings into the building and 10 feet (3,048 mm) from mechanical air intakes except where the opening is located 3 feet (914 mm) above the air intake. Openings shall comply with Sections R303.5.2 and R303.6.

Section M1506
Exhaust Ducts and Exhaust Openings

M1506.1 Ducts Construction. Where exhaust duct construction is not specified in this chapter, construction shall comply with Chapter 16.

M1506.2. Duct Length. The length of exhaust and supply ducts used with ventilating equipment shall not exceed the lengths determined in accordance with Table M1506.2.

Exception: Duct length shall not be limited where the duct system complies with the manufacturer's design criteria or where the flow rate of the installed ventilating equipment is verified by the installer or approved third party using a flow hood, flow grid or other airflow measuring device.

City of Houston Amendment

Analysis: ***New addition*** **–** The code establishes maximum exhaust duct lengths based on duct diameter, type of duct, number of turns, and the exhaust fan airflow rating.

CHANGE SIGNIFICANCE: The 2015 IRC introduces a prescriptive table for sizing exhaust ducts. The table is taken from ASHRAE 62.2-2010, addendum F. The intent is to match duct size (diameter and maximum length) to the airflow capacity of the exhaust fan to ensure the exhaust system operates efficiently and at the intended designed airflow rate. For residential buildings regulated by the IRC, mechanical exhaust is typically local exhaust for bathrooms and kitchens and may also be part of a whole-house mechanical ventilation system. Local exhaust is defined as an exhaust system that uses one or more fans to exhaust air from a specific room or rooms within a dwelling. Although the section title is "Exhaust Ducts and Exhaust Openings," the new Section M1506.2 also mentions supply ducts used for ventilating equipment. The intent is that the supply ducts for introducing outside air into a whole-house mechanical ventilation system are to be sized in accordance with the prescriptive values in Table M1506.2. The maximum duct length in the table is based on three variables: duct diameter, duct type (flexible or smooth wall) and the fan airflow rating. Smooth-wall ducts provide less resistance to airflow and the allowable duct lengths are greater than those for flexible ducts that have greater resistance to airflow. Footnote b provides the calculation method for converting the tabular values to apply to rectangular ducts. Footnote c establishes a 15-foot reduction in allowable duct length for each elbow installed. The code requires that the fan flow rate be verified by the manufacturer in accordance with ANSI/AMCA 210-ANSI/ASHRAE 51 or be field verified by the installer or an approved third party. The intent is to provide a minimum level of quality assurance for the installation of ventilation fans. Confirmation that a ventilation fan's flow rate follows ANSI/AMCA 210-ANSI/ASHRAE 51 is typically based on a Home Ventilating Institute (HVI) sticker in the fan housing.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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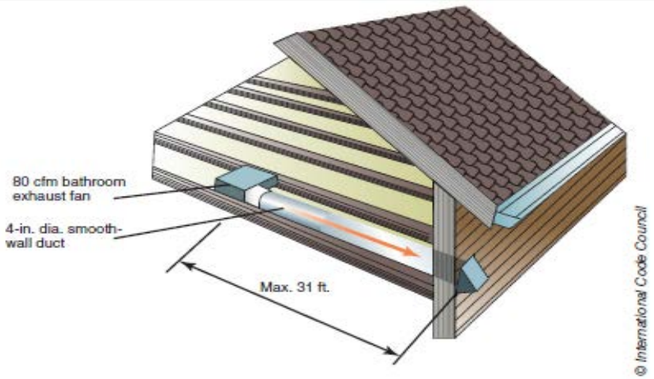

Maximum length of exhaust duct is based on fan rating and type and diameter of duct.

TABLE M1506.2 Duct Length

Duct Type	Flex Duct								Smooth-Wall Duct							
Fan airflow rating (CFM @ 0.25 inch wc[a])	50	80	100	125	150	200	250	300	50	80	100	125	150	200	250	300
Diameter[b] (inches)	Maximum length[c, d, e] (feet)															
3	X	X	X	X	X	X	X	X	5	X	X	X	X	X	X	X
4	56	4	X	X	X	X	X	X	114	31	10	X	X	X	X	X
5	NL	81	42	16	2	X	X	X	NL	152	91	51	28	4	X	X
6	NL	NL	158	91	55	18	1	X	NL	NL	NL	168	112	53	25	9
7	NL	NL	NL	NL	161	78	40	19	NL	NL	NL	NL	NL	148	88	54
8 and above	NL	NL	NL	NL	NL	189	111	69	NL	NL	NL	NL	NL	NL	198	133

a. Fan airflow rating shall be in accordance with ANSI/AMCA 210-ANSI/ASHRAE 51.
b. For non-circular ducts, calculate the diameter as four times the cross-sectional area divided by the perimeter.
c. This table assumes that elbows are not used. Fifteen feet (5 m) of allowable duct length shall be deducted for each elbow installed in the duct run.
d. NL = no limit on duct length of this size.
e. X = not allowed. Any length of duct of this size with assumed turns and fittings will exceed the rated pressure drop.

M1506.23 Exhaust Openings. Air exhaust openings shall terminate not less than 3 feet (914 mm) from property lines; 3 feet (914 mm) from operable and nonoperable openings into the building and 10 feet (3,048 mm) from mechanical air intakes except where the opening is located 3 feet (914 mm) above the air intake. Openings shall comply with Sections R303.5.2 and R303.6.

Justification: Approved through the ANSI process at the national code development hearings.

2012 Houston IRC – Chapter 16 Duct Systems	2015 Houston IRC – Chapter 16 Duct Systems	Code Analysis

M1601.1.1 Above-ground duct systems. Above-ground *duct systems* shall conform to the following:

1. *Equipment* connected to *duct systems* shall be designed to limit discharge air temperature to a maximum of 250°F (121°C).
2. Factory-made air ducts shall be constructed of Class 0 or Class 1 materials as designated in Table M1601.1.1 (1).
3. Fibrous duct construction shall conform to the SMACNA Fibrous Glass Duct Construction Standards or NAIMA Fibrous Glass Duct Construction Standards.
4. Minimum thickness of metal duct material shall be as listed in Table M1601.1.1 (2). Galvanized steel shall conform to ASTM A 653. Metallic ducts shall be fabricated in accordance with SMACNA Duct Construction Standards Metal and Flexible.
5. Use of gypsum products to construct return air ducts or plenums is permitted, provided that the air temperature does not exceed 125°F (52°C) and exposed surfaces are not subject to condensation.
6. *Duct systems* shall be constructed of materials having a flame spread index not greater than 200.
7. Stud wall cavities ~~and the spaces between solid floor joists~~ to be used as air plenums shall comply with the following conditions:
   - **7.1.** These cavities or spaces shall not be used as a plenum for supply air.
   - **7.2.** These cavities or spaces shall not be part of a required fire-resistance-rated assembly.
   - **7.3.** Stud wall cavities shall not convey air from more than one floor level.
   - **7.4.** Stud wall cavities and joist-space plenums shall be isolated from adjacent concealed spaces by tight-fitting fire blocking in accordance with Section R602.8.
   - **7.5.** Stud wall cavities in the outside walls of building envelope assemblies shall not be utilized as air plenums.

M1601.1.1 Above-ground duct systems. Above-ground *duct systems* shall conform to the following:

1. *Equipment* connected to *duct systems* shall be designed to limit discharge air temperature to not greater than 250°F (121°C).
2. Factory-made ducts shall be listed and labeled in accordance with UL 181 and installed in accordance with the manufacturer's instructions.
3. Fibrous glass duct construction shall conform to the SMACNA *Fibrous Glass Duct Construction Standards* or NAIMA *Fibrous Glass Duct Construction Standards*.
4. Field-fabricated and shop-fabricated metal and flexible duct constructions shall conform to the SMACNA HVAC *Duct Construction Standards—Metal and Flexible* except as allowed by Table M1601.1.1. Galvanized steel shall conform to ASTM A 653.
5. The use of gypsum products to construct return air ducts or plenums is permitted, provided that the air temperature does not exceed 125°F (52°C) and exposed surfaces are not subject to condensation.
6. *Duct systems* shall be constructed of materials having a flame spread index of not greater than 200.
7. Stud wall cavities and the spaces between solid floor joists to be used as air plenums shall comply with the following conditions:
   - **7.1.** These cavities or spaces shall not be used as a plenum for supply air.
   - **7.2.** These cavities or spaces shall not be part of a required fire-resistance-rated assembly.
   - **7.3.** Stud wall cavities shall not convey air from more than one floor level.
   - **7.4.** Stud wall cavities and joist-space plenums shall be isolated from adjacent concealed spaces by tight-fitting fire-blocking in accordance with Section R602.8.
   - **7.5.** Stud wall cavities in the outside walls of building envelope assemblies shall not be utilized as air plenums.

City of Houston Amendment

Analysis: The previous COH amendment was omitted. This amendment is no longer needed as duct design requirements of SMACNA address the issue sufficiently. The list of duct system requirements has been revised to reference the applicable standards and delete redundant language. The table for material thickness of metal ducts was replaced with what is currently consistent with the SMACNA sheet metal construction standard. ***No changes to the previous code requirements or code intent.***

CHANGE SIGNIFICANCE: Minor revisions to the list of seven requirements for above-ground duct systems clarify the application and bring the information up to date with the referenced standards. The reference to duct classification in Item 2 has been removed, and Table M1601.1.1(1) for classification of factory-made air ducts based on flame spread index has been deleted. These burning classifications are already covered in the referenced UL 181 standard and it is not necessary to repeat them in the code. Item 4 clarifies that the referenced standard, SMACNA HVAC Duct Construction Standards - Metal and Flexible, applies to both field-fabricated and shop-fabricated metal and flexible duct construction. Minimum sheet metal thickness is determined by the standard or by revised Table M1601.1.1 (previously Table M1601.1.1[2]).

Before the 2009 edition of the IRC, the code permitted a material thickness of 30 gage (0.013 inches) for round metal ducts 14 inches or less in diameter. In the 2009 IRC, the minimum sheet metal thickness was increased to 28 gage (0.0157 inches). The 2015 IRC returns the minimum thickness for 14-inch diameter ducts to 30 gage (0.013 inches). Table M1601.1.1 has replaced Table M1601.1.1(2). The new table expands the number of rows for duct sizes and bases the material thickness on either ½-inch or 1-inch water gage static pressure. The table is consistent with information in SMACNA HVAC Duct Construction Standards -Metal and Flexible. Proponents of the change reasoned that there was no demonstrated justification for eliminating 30-gage sheet metal thickness for 14-inch diameter duct from a strength, longevity, functionality, economic or energy standpoint.

Justification: This amendment is no longer needed as duct design requirements address the issue sufficiently and the general rules of Section 602 in the *Houston Mechanical Code* already address combustible construction in plenums.

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8. Wood floor joists or trusses that serve dwelling units shall not be located within a return air plenum.

TABLE M1601.1.1(2)
GAGES OF METAL DUCTS AND PLENUMS USED FOR HEATING OR COOLING

DUCT SIZE	GALVANIZED		ALUMINUM
	Minimum Thickness (inches)	Equivalent Galvanized Gage No.	Minimum Thickness (inches)
Round ducts and enclosed rectangular ducts			
14 inches or less	0.0157	28	0.0145
16 and 18 inches	0.0187	26	0.018
20 inches and over	0.0236	24	0.023
Exposed rectangular ducts			
14 inches or	0.0157	28	0.0145
Over 14" inches	0.0187	26	0.018

For SI: 1 inch = 25.4 mm.
a. For duct gages and reinforcement requirements at static pressures of 1/2 inch, 1 inch and 2 inches w.g., SMACNA *Duct Construction Standard*, Tables 2-2-2 and 2-3 shall apply.

TABLE ~~M1601.1(2)~~ M1601.1.1 Duct Construction Minimum Sheet Metal Thickness for Single Dwelling Units[a] ~~Gages of Metal Ducts and Plenums Used For Heating or Cooling~~

ROUND DUCT DIAMETER (inches)	STATIC PRESSURE ½-inch water gage Thickness (inches)		STATIC PRESSURE 1-inch water gage Thickness (inches)	
	Galvanized	Aluminum	Galvanized	Aluminum
≤12	0.013	0.018	0.013	0.018
12 to 14	0.013	0.018	0.016	0.023
15 to 17	0.016	0.023	0.019	0.027
18	0.016	0.023	0.024	0.034
19 to 20	0.019	0.027	0.024	0.034

RECTANGULAR DUCT DIMENSION (inches)	STATIC PRESSURE ½-inch water gage Thickness (inches)		STATIC PRESSURE 1-inch water gage Thickness (inches)	
	Galvanized	Aluminum	Galvanized	Aluminum
≤8	0.013	0.018	0.013	0.018
9 to 10	0.013	0.018	0.016	0.023
11 to 12	0.016	0.023	0.019	0.027
13 to 16	0.019	0.027	0.019	0.027
17 to 18	0.019	0.027	0.024	0.034
19 to 20	0.024	0.034	0.024	0.034

For SI: 1 inch = 25.4 mm, 1-inch water gage = 249 Pa.
a. Ductwork that exceeds 20 inches by dimension or exceeds a pressure of 1-inch water gage (250 Pa) shall be constructed in accordance with SMACNA *HVAC Duct Construction Standards Metal and Flexible*.

~~Duct size~~ | ~~Galvanized: Minimum Thickness (inches)~~ | ~~Galvanized: Equivalent Galvanized Gage No.~~ | ~~Aluminum: Minimum Thickness (inches)~~

~~Round ducts and enclosed rectangular ducts~~
~~14 inches or less~~ | ~~0.0157~~ | ~~28~~ | ~~0.0145~~
~~16 and 18 inches~~ | ~~0.0187~~ | ~~26~~ | ~~0.018~~
~~20 inches and over~~ | ~~0.0236~~ | ~~24~~ | ~~0.023~~
~~Exposed rectangular ducts~~
~~14 inches or~~ | ~~0.0157~~ | ~~28~~ | ~~0.0145~~
~~Over 14" inches~~ | ~~0.0187~~ | ~~26~~ | ~~0.018~~

~~For SI: 1 inch = 25.4 mm.~~
~~a. For duct gages and reinforcement requirements at static pressures of 1/2 inch, 1 inch and 2 inches w.g., SMACNA Duct Construction Standard, Tables 2-1, 2-2 and 2-3 shall apply.~~

M1601.4 Installation. Duct installation shall comply with Sections M1601.4.1 through M1601.4.9.

M1601.4.1 Joints, seams, and connections. All Longitudinal and transverse joints, seams and connections in metallic and nonmetallic ducts shall be constructed as specified in SMACNA *HVAC Duct Construction Standards—Metal and Flexible* and NAIMA *Fibrous Glass Duct Construction Standards*. All joints, longitudinal and transverse seams, and connections in ductwork shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems or tapes.

Closure systems used to seal flexible air ducts and flexible air connectors shall comply with UL 181B and shall be marked "181 B-FX" for pressure-sensitive tape or "181 BM" for mastic. Duct connections to flanges of air distribution system equipment shall be sealed and mechanically fastened. Mechanical fasteners for use with flexible nonmetallic air ducts shall comply with UL 181B and shall be marked 181B-C. Crimp joints for round metallic ducts shall have a contact lap of not less than 1 inch (25.4 mm) and shall be mechanically fastened by means of not less than three sheet-metal screws or rivets equally spaced around the joint.

Closure systems used to seal metal ductwork shall be installed in accordance with the manufacturer's instructions. Round metallic ducts shall be mechanically fastened by means of at least three sheet metal screws or rivets spaced equally around the joint. Unlisted duct tape shall not be permitted as a sealant on any duct.

Exceptions:

1. Spray polyurethane foam 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.

M1601.4 Installation. Duct installation shall comply with Sections M1601.4.1 through M1601.4.910.

M1601.4.1 Joints, Seams and Connections. All Longitudinal and transverse joints, seams and connections in metallic and nonmetallic ducts shall be constructed as specified in SMACNA *HVAC Duct Construction Standards—Metal and Flexible* and NAIMA *Fibrous Glass Duct Construction Standards*. All Joints, longitudinal and transverse seams, and connections in ductwork shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems, liquid sealants, or tapes. Tapes and mastics used to seal fibrous glass ductwork shall be listed and labeled in accordance with UL 181 A and shall be marked "181 A-P" for pressure-sensitive tape, "181 A-M" for mastic or "181 A-H" for heat-sensitive tape.

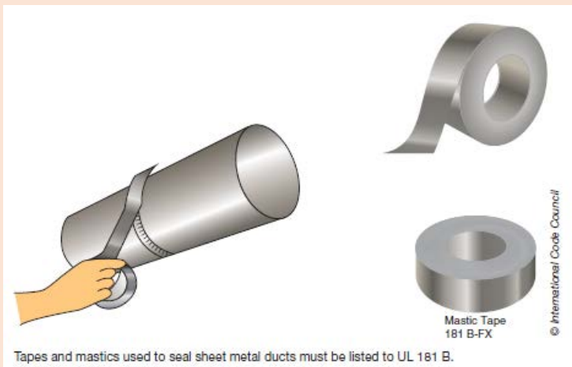
~~Closure systems~~ Tapes and mastics used to seal metallic and flexible air ducts and flexible air connectors shall comply with UL 181 B and shall be marked "181 B-FX" for pressure-sensitive tape or "181 BM" for mastic. Duct connections to flanges of air distribution system equipment shall be sealed and mechanically fastened. Mechanical fasteners for use with flexible nonmetallic air ducts shall comply with UL 181 B and shall be marked "181 B-C." Crimp joints for round metallic ducts shall have a contact lap of not less than 1 inch (25 mm) and shall be mechanically fastened by means of not less than three sheet-metal screws or rivets equally spaced around the joint.

Closure systems used to seal ~~metal~~ all ductwork shall be installed in accordance with the manufacturers' instructions. ~~Round metallic ducts shall be mechanically fastened by means of at least three sheet metal screws or rivets spaced equally around the joint. Unlisted duct tape shall not be permitted as a sealant on any duct.~~

Exceptions:

City of Houston Amendment

Analysis: ***Modification*** – Tapes and mastics used to seal sheet metal ducts must be listed to UL 181 B as has been required for sealing flexible ducts. Snap-lock and button-lock seams are no longer exempt from the sealing requirements.



Tapes and mastics used to seal sheet metal ducts must be listed to UL 181 B.

CHANGE SIGNIFICANCE: Section M1601.4.1, Joints, Seams and Connections, has been revised to remove redundant language and to clarify the sealing requirements and applicable standards for various types of ducts. The UL 181 A standard is specific to fibrous glass duct systems and UL 181 B is specific to flexible duct systems. There is no closure system listed specifically for metal ducts, but UL 181 B is judged appropriate for sealing of metal ducts. All mastics and tapes used for sealing ductwork must be listed, so the language prohibiting unlisted duct tape is unnecessary and has been removed. The manufacturer's instructions now apply to closure systems for all types of ducts, not just those for metal ducts.

Snap-lock and button-lock types of ducts are no longer exempt from the closure requirements because such types allow considerable air leakage unless sealed. Some manufacturers place a sealant or gasket in the seams of snap- or button-lock ducts, which satisfies the intent of the code to have a closure (sealing) system for such ducts. Some locking joints are leak-proof, such as mechanically folded seams used for spiral seam ducts, and the code still recognizes this exception.

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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. **M1601.4.2 Plastic duct joints.** Joints between plastic ducts and plastic fittings shall be made in accordance with the manufacturer's installation instructions. **M1601.4.3 Support.** Metal ducts shall be supported by 1/2-inch-wide (13 mm) 18-gage metal straps or 12-gage galvanized wire at intervals not exceeding 10 feet (3,048 mm) or other approved means. Nonmetallic ducts shall be supported in accordance with the manufacturer's installation instructions.	**1.** Spray polyurethane foam 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.** For ducts having a static pressure classification of less than 2 inches of water column (500 Pa), additional closure systems shall not be required for continuously welded joints and seams and locking-type ~~longitudinal~~ joints and seams of other than the snap-lock and button-lock types ~~in ducts operating at static pressures less than 2 inches of water column (500 Pa) pressure classification shall not require additional closure systems.~~ **M1601.4.2 Duct Lap.** Crimp joints for round and oval metal ducts shall be lapped not less than 1 inch (25 mm) and the male end of the duct shall extend into the adjoining duct in the direction of airflow. ~~**M1601.4.3**~~ **M1601.4.4 Support.** ~~Metal ducts shall be supported by 1/2-inch-wide (13 mm) 18-gage metal straps or 12-gage galvanized wire at intervals not exceeding 10 feet (3048 mm) or other approved means. Nonmetallic~~ Factory-made ducts listed in accordance with UL 181 shall be supported in accordance with the manufacturer's installation instructions. Field- and shop-fabricated fibrous glass ducts shall be supported in accordance with the SMACNA *Fibrous Glass Duct Construction Standards* or the NAIMA *Fibrous Glass Duct Construction Standards*. Field- and shop-fabricated metal and flexible ducts shall be supported in accordance with the SMACNA HVAC *Duct Construction Standards—Metal and Flexible*. *(No significant changes to portions of Section M1601.4 not shown.)*	*New Section M1601.4.2 prescribes the appropriate connection of crimp joints for round and oval metal ducts in the direction of airflow. Previously, the code was silent on oval ducts, which are commonly installed in dwellings, and did not address the direction of the lap relative to airflow.* *Section M1601.4.4 regarding duct supports has been revised to reference the appropriate SMACNA standards and the manufacturer's instructions as opposed to prescribing a support interval and method of support. The previous 10-foot interval requirement was considered too broad and inappropriate for many sizes and types of ducts. In practice, 18-gage metal straps are not typically used to support residential ducts.* **Justification:** Approved through the ANSI process at the national code development hearings.
M1601.4.3 Support. Metal ducts shall be supported by 1~~½~~-inch-wide (26~~-13~~ mm) 24~~18~~-gage metal straps or 12-gage galvanized wire at intervals not exceeding 10 feet (3048 mm) or other *approved* means. Nonmetallic ducts shall be supported in accordance with the manufacturer's installation instructions.	**M1601.4.4 Support.** Factory-made ducts listed in accordance with UL 181 shall be supported in accordance with the manufacturer's installation instructions. Field- and shop-fabricated fibrous glass ducts shall be supported in accordance with the SMACNA *Fibrous Glass Duct Construction Standards* or the NAIMA *Fibrous Glass Duct Construction Standards*. Field- and shop-fabricated metal and flexible ducts shall be supported in accordance with the SMACNA HVAC *Duct Construction Standards—Metal and Flexible*.	***City of Houston Amendment*** **Analysis:** The previous COH amendment was omitted. The amendment is no longer needed because the IRC 2015 now references the construction and installation requirements of the industry standard "SMACNA" for duct design and the SMACNA standards address the issue in detail. **Justification:** This amendment is no longer needed as duct design requirements address the issue sufficiently.
M1601.4.9 Flood hazard areas. In flood hazard areas as established by Table R301.2(1), *duct systems* shall be located or installed in accordance with Chapter 19 of the *City Code* ~~Section R322.1.6~~.	**M1601.4.10 Flood hazard areas.** In flood hazard areas as established by Table R301.2(1), *duct systems* shall be located or installed in accordance with Chapter 19 of the *City Code* ~~Section R322.1.6~~.	***City of Houston Amendment*** **Analysis:** Previous model code and COH amendment of IRC 2012 M1601.4.9 are relocated to IRC 2015 Section M1601.4.10. ***No changes to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
SECTION M1602 **RETURN AIR** **M1602.1 Return air.** Return air shall be taken from inside the *dwelling*. Dilution of return air with outdoor air shall be permitted. **M1602.2 Prohibited sources.** Outdoor and return air for a forced-air heating or cooling system shall not be taken from the following locations:	**SECTION M1602** **RETURN AIR** **M1602.1 Outdoor air openings.** Outdoor intake openings shall be located in accordance with Section R303.5.1. Opening protection shall be in accordance with Section R303.6. **M1602.2 Return air openings.** Return air openings for heating, ventilation and air conditioning systems shall comply with all of the following:	***City of Houston Amendment*** **Analysis:** ***Modification*** – The provisions for return air have been simplified and clarified to improve understanding while preserving the intent of keeping contaminants out of the airstream of the heating, ventilation, and air-conditioning (HVAC) system. The provisions for outdoor air openings have been removed and the code now references the applicable provisions for outdoor air in Chapter 3.

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1. Closer than 10 feet (3,048 mm) to an *appliance* vent outlet, a vent opening from a plumbing drainage system or the discharge outlet of an exhaust fan, unless the outlet is 3 feet (914 mm) above the outside air inlet. **2.** Where flammable vapors are present; or where located less than 10 feet (3048 mm) above the surface of any abutting public way or driveway; or where located at grade level by a sidewalk, street, alley, or driveway. **3.** A room or space, the volume of which is less than 25 percent of the entire volume served by the system. Where connected by a permanent opening having an area sized in accordance with ACCA Manual D, adjoining rooms or spaces shall be considered as a single room or space for the purpose of determining the volume of the rooms or spaces. **Exception:** The minimum volume requirement shall not apply where the amount of return air taken from a room or space is less than or equal to the amount of supply air delivered to the room or space.	**1.** Openings shall not be located less than 10 feet (3,048 mm) measured in any direction from an open combustion chamber or draft hood of another appliance located in the same room or space. **2.** The amount of return air taken from any room or space shall be not greater than the flow rate of supply air delivered to such room or space. **3.** Return and transfer openings shall be sized in accordance with the appliance or equipment manufacturers' installation instructions, Manual D, or the design of the registered design professional. **4.** Return air shall not be taken from a closet, bathroom, toilet room, kitchen, garage, mechanical room, boiler room, furnace room or unconditioned attic. **Exceptions:** **1.** Taking return air from a kitchen is not prohibited where such return air openings serve the kitchen only and are located not less than 10 feet (3048 mm) from the cooking appliances. **2.** Dedicated forced-air systems serving only the garage shall not be prohibited from obtaining return air from the garage. **3.** Taking return air from an unconditioned crawl space shall not be accomplished through a direct connection to the return side of a forced-air furnace. Transfer openings in the crawl space enclosure shall not be prohibited. **4.** Return air from one dwelling unit shall not be discharged into another dwelling unit.	*CHANGE SIGNIFICANCE: Section M1602 has been reorganized and simplified to improve understanding and application. Previously, the code listed locations that were prohibited as sources for return air. Item 3 regarding a space that was less than 25 percent of the entire volume served by the system was not well understood and not typically followed. For modern construction this item was considered outdated and has been removed. In its place, the code now simply requires that the amount of return air taken from any room is not greater than the supply air delivered to that room. Item 5 regarding spaces containing fuel-fired appliances including multiple exceptions was also problematic and has been removed in its entirety. The intent of the return air provisions is to keep contaminants out of the airstream being returned to the air handler where the air is then circulated throughout the dwelling unit. The new text accomplishes that goal and captures the intent of the previous provisions.* **Justification:** Approved through the ANSI process at the national code development hearings.
M1602.2 Prohibited sources. Outdoor and return air for a forced-air heating or cooling system shall not be taken from the following locations: **1.** Closer than 10 feet (3048 mm) to an *appliance* vent outlet, a vent opening from a plumbing drainage system or the discharge outlet of an exhaust fan, unless the outlet is 3 feet (914 mm) above the outside air inlet. **2.** Where flammable vapors are present; or where located less than 10 feet (3048 mm) above the surface of any abutting public way or driveway; or where located at grade level by a sidewalk, street, alley, or driveway. **3.** A room or space, the volume of which is less than 25 percent of the entire volume served by the system. Where connected by a permanent opening having an area sized in accordance with ACCA Manual D, adjoining rooms or spaces shall be considered as a single room or space for the purpose of determining the volume of the rooms or spaces. **Exception:** The minimum volume requirement shall not apply where the amount of return air taken from a room or space is less than or equal to the amount of supply air delivered to the room or space. **4.** A closet, bathroom, toilet room, kitchen, garage, boiler room, furnace room, unconditioned attic, or another dwelling unit. **Exception:** Dedicated forced-air systems serving only a garage shall not be prohibited from obtaining return air from the garage. **5.** A room or space containing a fuel-burning appliance where such room or space serves as the sole source of return air. **Exceptions:** **1.** The fuel-burning appliance is a direct-vent appliance or an appliance not requiring a vent in accordance with Section M1801.1 or Chapter 24. **2.** The room or space complies with the following requirements:	**M1602.2 Return air openings.** Return air openings for heating, ventilation and air conditioning systems shall comply with all of the following: **1.** Openings shall not be located less than 10 feet (3,048 mm) measured in any direction from an open combustion chamber or draft hood of another appliance located in the same room or space. **2.** The amount of return air taken from any room with a door installed that confines the room or space shall be not greater than the flow rate of supply air delivered to such room or space. **3.** Return and transfer openings shall be sized in accordance with the appliance or equipment manufacturers' installation instructions, Manual D, or the design of the registered design professional. **4.** Return air shall not be taken from a closet, bathroom, toilet room, kitchen, garage, mechanical room, boiler room, furnace room or unconditioned attic. **Exceptions:** **1.** Taking return air from a kitchen is not prohibited where such return air openings serve the kitchen only and are located not less than 10 feet (3,048 mm) from the cooking appliances. **2.** Dedicated forced-air systems serving only the garage shall not be prohibited from obtaining return air from the garage. **3.** Taking return air from an unconditioned crawl space shall not be accomplished through a direct connection to the return side of a forced-air furnace. Transfer openings in the crawl space enclosure shall not be prohibited. **4.** Return air from one dwelling unit shall not be discharged into another dwelling unit.	***City of Houston Amendment*** **Analysis:** The provisions of this section was relocated from the same section number in the 2012 IRC but was extensively updated in the 2015 code. In addition, a COH amendment was added to provide additional clarity. The provisions for return air have been simplified and clarified to improve understanding while preserving the intent of keeping contaminants out of the airstream of the heating, ventilation and air-conditioning (HVAC) system. The provisions for outdoor air openings have been removed and the code now references the applicable provisions for outdoor air in Chapter 3. ***No changes to the previous code requirements or code intent.*** *CHANGE SIGNIFICANCE: Section M1602 has been reorganized and simplified to improve understanding and application. Previously, the code listed locations that were prohibited as sources for return air. Item 3 regarding a space that was less than 25 percent of the entire volume served by the system was not well understood and not typically followed. For modern construction this item was considered outdated and has been removed. In its place, the code now simply requires that the amount of return air taken from any room is not greater than the supply air delivered to that room. Item 5 regarding spaces containing fuel-fired appliances including multiple exceptions was also problematic and has been removed in its entirety. The intent of the return air provisions is to keep contaminants out of the airstream being returned to the air handler where the air is then circulated throughout the dwelling unit. The new text accomplishes that goal and captures the intent of the previous provisions.* **Justification:** Amendment adds clarity and is included by Legal per 10-12-2021 blackline file.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
COLOR CODE INDEX: **Turquoise** = NEW or Modified Text by ICC in 2015 ~~**Yellow Strike through**~~ = Text Deleted from the Code by COH	**Text Underlined** = COH Amendment added (NEW) **Green Text** = NEW or Modified Text by COH in 2015	**Grey Text** = Previous COH Amendment Brought Forward to 2015 ~~**Strike through**~~ = Text Deleted from the Code by ICC
2.1. The return air shall be taken from a room or space having a volume exceeding 1 cubic foot for each 10 Btu/h (9.6 L/W) of combined input rating of all fuel-burning appliances therein. **2.2.** The volume of supply air discharged back into the same space shall be approximately equal to the volume of return air taken from the space. **2.3.** Return-air inlets shall not be located within 10 feet (3048 mm) of a draft hood in the same room or space or the combustion chamber of any atmospheric-burner appliance in the same room or space. **3.** Rooms or spaces containing solid-fuel burning appliances if return-air inlets are located not less than 10 feet (3048 mm) from the firebox of those appliances. **6.** An unconditioned crawl space by means of direct connection to the return side of a forced air system. Transfer openings in the crawl space enclosure shall not be prohibited.		
SECTION M1603 **CENTRAL VACUUM SYSTEMS** **M1603.1 Central vacuum systems.** Ducts used in central vacuum-cleaning systems within a dwelling unit shall be permitted to be of PVC pipe. Penetrations of fire walls, rated floor-ceiling or rated roof-ceiling assemblies shall comply with this code. Copper or ferrous pipes or conduits shall be used to extend through the wall assembly separation between a garage and a dwelling unit for a central vacuum unit.	**SECTION M1603** **CENTRAL VACUUM SYSTEMS** **M1603.1 Central vacuum systems.** Ducts used in central vacuum-cleaning systems within a dwelling unit shall be permitted to be of PVC pipe. Penetrations of fire walls, rated floor-ceiling or rated roof-ceiling assemblies shall comply with this code. Copper or ferrous pipes or conduits shall be used to extend through the wall assembly separation between a garage and a dwelling unit for a central vacuum unit.	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. No change to the code requirements or code intent. **Justification:** This amendment is needed to ensure conformity with state and local government policy.
2012 Houston IRC – Chapter 19 Special Appliances, Equipment and Systems	**2015 Houston IRC – Chapter 19 Special Appliances, Equipment and Systems**	**Code Analysis**
SECTION M1904 **GASEOUS HYDROGEN SYSTEMS** **M1904.1 Installation.** Gaseous hydrogen systems shall be installed in accordance with the applicable requirements of Sections M1307.4 and M1903.1 and ~~the *International Fuel Gas Code,*~~ the ~~*International*~~ *Fire Code,* and the ~~*International*~~ *Building Code*.	**SECTION M1904** **GASEOUS HYDROGEN SYSTEMS** **M1904.1 Installation.** Gaseous hydrogen systems shall be installed in accordance with the applicable requirements of Sections M1307.4 and M1903.1 and the *International Fuel Gas Code*, the *International Fire Code,* and the *International Building Code*.	***City of Houston Amendment*** **Analysis:** The COH amendment was omitted. ***No change to the previous code requirements or code intent.*** **Justification:** These amendment changes are no longer needed as the definition has been added to Chapter 2.
2012 Houston IRC – Chapter 22 Special Piping and Storage Systems	**2015 Houston IRC – Chapter 22 Special Piping and Storage Systems**	**Code Analysis**
M2201.1 Materials. Supply tanks shall be *listed* and *labeled* and shall conform to UL 58 for underground tanks and UL 80 for indoor tanks. **NOTE:** All special pipe and storage systems shall conform to Chapter 57 of the *Fire Code*.	**M2201.1 Materials.** Supply tanks shall be *listed* and *labeled* and shall conform to UL 58 for underground tanks and UL 80 for indoor tanks. **NOTE:** All special pipe and storage systems shall conform to Chapter 57 of the *Fire Code*.	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is necessary to provide a reference to the additional applicable code sections for supply tanks.
2012 Houston IRC – Part 6— Chapters 24 Fuel Gas	**2015 Houston IRC – Part 6—Chapter 24 Fuel Gas**	**Code Analysis**
Part 6—Chapter 24 Fuel Gas ■ ***Chapter 24 Fuel Gas*** *Fuel gas systems are covered in Part 6, including provisions for approved materials as well as the design and installation of fuel gas piping and other system components. The fuel gas provisions of the IRC are taken directly from the International Fuel Gas Code (IFGC). In order to make the correlation and coordination of the two codes easier, after each fuel gas section of the IRC the original section of the IFGC is shown in parentheses. The fuel gas portion of the IRC contains its own specific definitions in Section G2403 in addition to the general definitions found in Chapter 2 of the IRC. The text, tables and figures in other sections of Chapter 24 address the technical issues of fuel gas systems, such as appliance installation; materials, sizing, and installation of fuel gas piping systems; piping support; flow controls; connections; combustion air; venting; and other related system requirements.* ■		

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
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G2404.11-Condensate Pumps; G2411.1.1-Electrical Bonding of Corrugated Stainless Steel Tubing; G2413.2-Maximum Gas Demand; G2414.6-Plastic Pipe, Tubing and Fittings; G2415.5-Fittings in Concealed Locations; **G2415.7-**Protection of Concealed Piping Against Physical Damage; **G2421.2-**Medium-Pressure Regulators; **G2422.1-**Connecting Portable and Movable Appliances; **G2426.7.1-**Door Clearance to Vent Terminals; **G2427.4.1, G2427.6.8.3-**Plastic Piping for Appliance Vents; **G2427-V**enting System Termination Location; **G2439.4, G2439.7-**Clothes Dryer Exhaust Ducts; **G2447.2-**Prohibited Location of Commercial Cooking Appliances

2012 Houston IRC – Chapter 24 Fuel Gas	2015 Houston IRC – Chapter 24 Fuel Gas	Code Analysis
The text of this chapter is extracted from the 2012 edition of the *International Fuel Gas Code* and has been modified where necessary to conform to the scope of application of the *International Residential Code for One- and Two-Family Dwellings*. The section numbers appearing in parentheses after each section number are the section numbers of the corresponding text in the *International Fuel Gas Code.*	The text of this chapter is extracted from the 2015 edition of the *International Fuel Gas Code* and has been modified where necessary to conform to the scope of application of the *International Residential Code for One- and Two-Family Dwellings*. The section numbers appearing in parentheses after each section number are the section numbers of the corresponding text in the *International Fuel Gas Code*.	***City of Houston Amendment*** **Analysis:** A minor COH amendment was added to reflect the correct edition of the IFGC and to correlate with other volumes of the Houston Construction Code. ***No change to the previous code requirements or code intent.*** **Justification:** Legal has been added this paragraph per 10-12-2021 blackline file.
G2401.1 (101.2) Application. This chapter covers those *fuel gas piping systems,* fuel-gas *appliances,* and related accessories, *venting systems* and *combustion air* configurations most encountered in the construction of one- and two-family dwellings and structures regulated by this *code.* Coverage of *piping systems* shall extend from the *point of delivery* to the outlet of the *appliance* shutoff *valves* (see definition of *"Point of delivery"). Piping systems* requirements shall include design, materials, components, fabrication, assembly, installation, testing, inspection, operation, and maintenance. Requirements for gas *appliances* and related accessories shall include installation, *combustion* and ventilation air and venting and connections to *piping systems.* The omission from this chapter of any material or method of installation provided for in the ~~*International Fuel Gas*~~ *Plumbing Code* shall not be construed as prohibiting the use of such material or method of installation. *Fuel-gas piping systems,* fuel-gas *appliances,* and related accessories, *venting systems* and *combustion air* configurations not specifically covered in these chapters shall comply with the applicable provisions of the ~~*International Fuel Gas*~~ *Construction Code.* Gaseous hydrogen systems shall be regulated by the *International* ~~*Fuel Gas*~~ *Fire Code.* This chapter shall not apply to the following: **1.** Liquefied natural gas (LNG) installations. ***2.*** Temporary *LP-gas piping* for buildings under construction or renovation that is not to become part of the permanent *piping system.* **3.** Except as provided in Section G2412.1.1, *gas piping, meters,* gas *pressure regulators,* and other appurtenances used by the serving gas supplier in the distribution of gas~~, other than undiluted LP-gas~~. ***4.*** Portable LP-gas *appliances* and *equipment* of all types that is not connected to a fixed fuel *piping system.* **5.** Portable fuel cell *appliances* that are neither connected to a fixed *piping system* nor interconnected to a power grid. **6.** Installation of hydrogen gas, LP-gas and compressed natural gas (CNG) systems on vehicles. **7.** Liquid petroleum gas facilities regulated by the Railroad Commission of Texas pursuant to Chapter 113 of the *Texas Natural Resources Code.* **NOTE:** All fuel oil facilities and piping shall conform to Chapter 57 of the *International Fire Code.*	**G2401.1 (101.2) Application.** This chapter covers those fuel gas *piping systems*, fuel gas *appliances* and related accessories, *venting systems* and *combustion air* configurations most encountered in the construction of one- and two-family *dwellings* and *structure*s regulated by this *code.* Coverage of *piping systems* shall extend from the *point of delivery* to the outlet of the *appliance* shutoff *valves* (see definition of "*Point of delivery*"). *Piping systems* requirements shall include design, materials, components, fabrication, assembly, installation, testing, inspection, operation, and maintenance. Requirements for gas *appliances* and related accessories shall include installation, combustion and ventilation air and venting and connections to *piping systems.* The omission from this chapter of any material or method of installation provided for in the ~~*International Fuel Gas*~~ *Plumbing Code* shall not be construed as prohibiting the use of such material or method of installation. Fuel gas *piping systems,* fuel gas *appliances* and related accessories, *venting systems* and *combustion air* configurations not specifically covered in these chapters shall comply with the applicable provisions of the ~~*International Fuel Gas*~~ *Plumbing Code.* Gaseous hydrogen systems shall be regulated by ~~Chapter 7 of~~ the ~~*International Fuel Gas*~~ *Fire Code.* This chapter shall not apply to the following: **1.** Liquefied natural gas (LNG) installations. **2.** Temporary *LP-gas piping* for buildings under construction or renovation that is not to become part of the permanent *piping system*. **3.** Except as provided in Section G2412.1.1, gas *piping*, *meters,* gas *pressure regulators*, and other appurtenances used by the serving gas supplier in the distribution of gas, other than undiluted LP-gas. **4.** Portable LP-gas *appliances* and *equipment* of all types that is not connected to a fixed fuel *piping system.* **5.** Portable fuel cell *appliances* that are neither connected to a fixed *piping system* nor interconnected to a power grid. **6.** Installation of hydrogen gas, LP-gas and compressed natural gas (CNG) systems on vehicles. **7.** Liquid petroleum gas facilities regulated by the Railroad Commission of Texas pursuant to Chapter 113 of the *Texas Natural Resources Code.* **NOTE:** All fuel oil facilities and piping shall conform to Chapter 61 of the *Fire Code.*	***City of Houston Amendment*** **Analysis:** The previous COH amendment include minor editorial changes to reference correct chapter of the Fire Code. ***No change to the previous code requirements or code intent.*** **Justification:** The amendment was modified to clarify the appropriate codes that are relevant to this section.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
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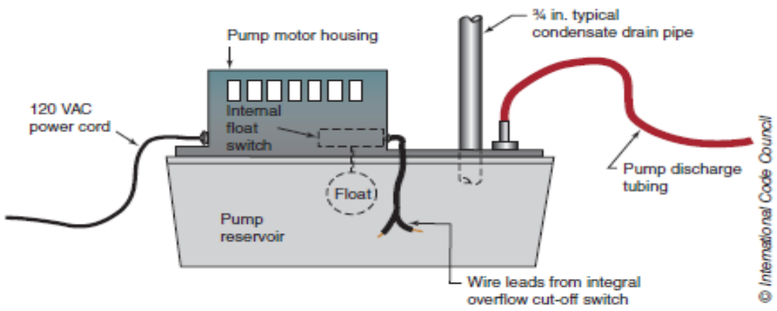
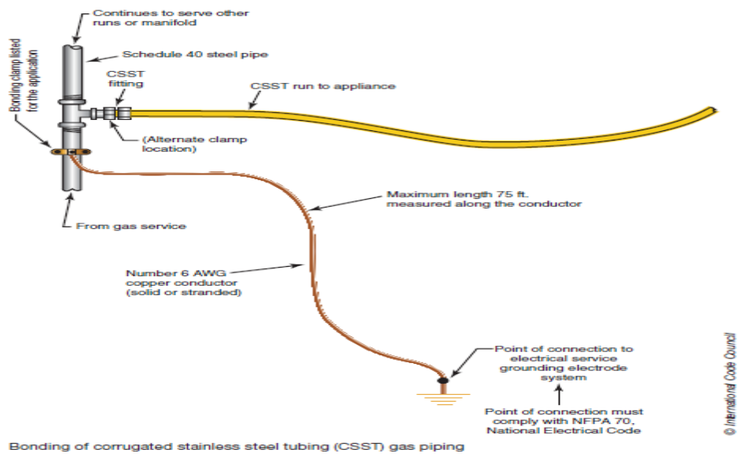
G2404.7 (301.11) Flood hazard. For structures located in flood hazard areas, the appliance, equipment, and system installations regulated by this code shall be located at or above the elevation required by Chapter 19 of the *City Code* ~~Section R322 for utilities and attendant equipment~~. ~~**Exception:** The appliance, equipment and system installations regulated by this code are permitted to be located below the elevation required by Section R322 for utilities and attendant equipment provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to such elevation.~~	**G2404.7 (301.11) Flood hazard.** For structures located in flood hazard areas, the appliance, equipment, and system installations regulated by this code shall be located at or above the elevation required by Chapter 19 of the *City Code* ~~Section R322 for utilities and attendant equipment~~. ~~**Exception:** The appliance, equipment and system installations regulated by this code are permitted to be located below the elevation required by Section R322 for utilities and attendant equipment provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to such elevation.~~	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
N/A	**G2404.11 (307.6) Condensate Pumps.** Condensate pumps located in uninhabitable spaces, such as attics and crawl spaces, shall be connected to the appliance or equipment served such that when the pump fails, the appliance or equipment will be prevented from operating. Pumps shall be installed in accordance with the manufacturer's instructions.  Condensate pumps located in attics and crawl spaces must be connected to the appliance such that when the pump fails the appliance shuts off.	***City of Houston Amendment*** **Analysis:** New addition – Condensate pumps located in uninhabitable spaces must be connected to the appliance to shut down the equipment in the event of pump failure. *CHANGE SIGNIFICANCE: Condensate pumps for Category IV condensing appliances are often located in attics and crawl spaces and above ceilings where they are not readily observable. If they fail, the condensate overflow can cause damage to the building components, especially where the overflow will not be noticed immediately. Most of such pumps are equipped with simple float controls that can be wired in series with the appliance or equipment control circuit. When the pump system fails, the float will rise in the reservoir and open a switch, interrupting power to the appliance before the condensate starts to overflow the reservoir. These float controls are commonly not connected, or, in other cases, the pump might not be equipped with an overflow switch. This new code section requires the installation of condensate pumps that have this overflow shutoff capability and requires that the appliance or equipment served be connected to take advantage of that feature. This automatic shutoff feature will prevent water damage to the building in case of pump failure.* **Justification:** Approved through the ANSI process at the national code development hearings.
G2406.2 (303.3) Prohibited locations. *Appliances* shall not be located in sleeping rooms, bathrooms, toilet rooms, storage closets or surgical rooms, or in a space that opens only into such rooms or spaces, except where the installation complies with one of the following: **1.** The *appliance* is a direct-vent *appliance* installed in accordance with the conditions of the listing and the manufacturer's instructions. **2.** *Vented room heaters*, wall *furnaces*, vented decorative *appliances*, vented gas *fireplaces*, vented gas *fireplace* heaters and decorative *appliances* for installation in vented solid fuel-burning *fireplaces* are installed in rooms that meet the required volume criteria of Section G2407.5. **3.** ~~A single wall-mounted *unvented room heater* is installed in a bathroom and such *unvented room heater* is equipped as specified in Section G2445.6 and has an input rating not greater than 6,000 *Btu*/h (1.76 kW). The bathroom shall meet the required volume criteria of Section G2407.5.~~ **4.** ~~A single wall-mounted *unvented room heater* is installed in a bedroom and such *unvented room heater* is equipped as specified in Section G2445.6 and has an input rating not greater than 10,000 *Btu*/h (2.93~~	**G2406.2 (303.3) Prohibited locations.** *Appliances* shall not be located in sleeping rooms, bathrooms, toilet rooms, storage closets or surgical rooms, or in a space that opens only into such rooms or spaces, except where the installation complies with one of the following: **1.** The *appliance* is a direct-*vent appliance* installed in accordance with the conditions of the listing and the manufacturer's instructions. **2.** Vented room heaters, wall furnaces, vented decorative appliances, vented gas fireplaces, vented gas fireplace heaters and decorative appliances for installation in vented solid fuel-burning fireplaces are installed in rooms that meet the required volume criteria of Section G2407.5. **3.** ~~A single wall-mounted *unvented room heater* is installed in a bathroom and such *unvented room heater* is equipped as specified in Section G2445.6 and has an input rating not greater than 6,000 *Btu*/h (1.76 kW). The bathroom shall meet the required volume criteria of Section G2407.5.~~ **4.** ~~A single wall-mounted *unvented room heater* is installed in a bedroom and such *unvented room heater* is equipped as specified in Section G2445.6 and has an input rating not greater than 10,000 *Btu*/h (2.93~~	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure continuing standards of life and fire safety.

~~kW). The bedroom shall meet the required volume criteria of Section G2407.5.~~ **~~5.~~** The *appliance* is installed in a room or space that opens only into a bedroom or bathroom, and such room or space is used for no other purpose and is provided with a solid weather-stripped door equipped with an *approved* self-closing device. All *combustion air* shall be taken directly from the outdoors in accordance with Section G2407.6.	~~kW). The bedroom shall meet the required volume criteria of Section G2407.5.~~ **~~5.~~** The *appliance* is installed in a room or space that opens only into a bedroom or bathroom, and such room or space is used for no other purpose and is provided with a solid weather-stripped door equipped with an *approved* self-closing device. All *combustion air* shall be taken directly from the outdoors in accordance with Section G2407.6.	
G2411.1.1 (310.1.1) CSST. Corrugated stainless steel tubing (CSST) gas *piping* systems shall be bonded to the electrical service grounding electrode system. The bonding jumper shall connect to a metallic pipe or fitting between the *point of delivery* and the first downstream CSST fitting. The bonding jumper shall be not smaller than 6 AWG copper wire or equivalent. Gas piping systems that contain one or more segments of CSST shall be bonded in accordance with this section. Corrugated stainless steel (CSST) gas piping systems shall be bonded per the manufacturer's installation instructions.  Bonding of corrugated stainless steel tubing (CSST) gas piping	**G2411.1.1 (310.1.1) CSST.** Corrugated stainless steel tubing (CSST) gas *piping* systems and piping systems containing one or more segments of CSST shall be bonded to the electrical service grounding electrode system or, where provided, the lightning protection electrode system. **G2411.1.1.1 (310.1.1.1) Point of Connection.** The bonding jumper shall connect to a metallic pipe, pipe fitting or CSST fitting. **G2411.1.1.2 (310.1.1.2) Size and Material of Jumper.** The bonding jumper shall be not smaller than 6 AWG copper wire or equivalent. **G2411.1.1.3 (310.1.1.3) Bonding Jumper Length.** The length of the bonding jumper between the connection to a gas piping system and the connection to a grounding electrode system shall not exceed 75 feet (22 860 mm). Any additional grounding electrodes used shall be bonded to the electrical service grounding electrode system or, where provided, the lightning protection grounding electrode system. **G2411.1.1.4 (310.1.1.4) Bonding Connections.** Bonding connections shall be in accordance with NFPA 70. **G2411.1.1.5 (310.1.1.5) Connection Devices.** Devices used for making the bonding connections shall be listed for the application in accordance with UL 467.	***City of Houston Amendment*** **Analysis:** The COH amendment was omitted as the model code specifically requires compliance with the manufacturer's installation requirements in every application. The maximum allowable length of the bonding jumper for corrugated stainless steel tubing (CSST) is 75 feet. Bonding methods must comply with NFPA 70 and devices, such as clamps, must be listed in accordance with UL 467. ***No change to the previous code requirements or code intent.*** *CHANGE SIGNIFICANCE: An electrical bonding jumper becomes less effective as its length increases because of the increasing impedance to electrical flow on the wire. Therefore, shorter lengths improve bonding jumper effectiveness. Extensive testing was performed by the corrugated stainless-steel tubing (CSST) industry to determine how well electrical bonding protects the CSST from indirect lightning strikes and lightning induced currents. The testing concluded that the bonding was effective in preventing perforations in the CSST gas piping under the conditions of the predicted lightning events. The testing determined that the bonding jumper was functionally adequate up to approximately 100 feet in length and there were no data collected to support longer lengths. This suggested the need for a length limit. A length limit of 75 feet was chosen to provide a safety factor and because it was believed that 75 feet would accommodate most building designs and utility service entrances.* *Bonding the CCST to an independent grounding electrode (one that is electrically isolated from the building's grounding electrode system) is prohibited. However, the code does not prevent installation of a supplemental grounding electrode for additional protection. Where such supplemental electrodes are installed, the code requires that they be bonded back to the electrical service grounding electrode system, as is consistent with NFPA 70, National Electrical Code (NEC) requirements. The code does not intend to allow the length limit to be circumvented by installing supplemental electrodes. Where supplemental electrodes are installed by choice, the bonding jumper that connects them to the electrical service grounding electrode system is still limited to 75 feet.* *The points of connection to the electrical service grounding electrode system, the methods of connection, and the protection of the bonding conductors must be in accordance with NFPA 70 (NEC). The devices, such as clamps, that are used to connect the bonding jumper on both ends must be listed for the application and environment in which they are installed. For example, clamps used outdoors must be listed for exposure to the elements. Some commonly used bonding clamps are suitable only for indoor use and some are suitable for indoor and outdoor use.* **Justification:** This amendment is no longer needed due to increased requirements in the base code.
G2413.2 (402.2) Maximum gas demand. The volumetric flow rate of gas to be provided, in cubic feet per hour, shall be calculated using the manufacturer's input ratings of the *appliance*s served adjusted for altitude. Where an input rating is not indicated, the gas supplier, *appliance* manufacturer or a qualified agency shall be contacted, or the rating from Table G2413.2 shall be used for estimating the volumetric flow rate of gas to be supplied. The total connected hourly load shall be used as the basis for pipe sizing, assuming that all appliances could be operating at full capacity simultaneously. Where a diversity of load can be established, pipe sizing shall be permitted to be based on such loads.	**G2413.2 (402.2) Maximum gas demand.** The volumetric flow rate of gas to be provided shall be the sum of the maximum input of the *appliance*s served. The total connected hourly load shall be used as the basis for pipe sizing, assuming that all appliances could be operating at full capacity simultaneously. Where a diversity of load can be established, pipe sizing shall be permitted to be based on such loads. The volumetric flow rate of gas to be provided shall be adjusted for altitude where the installation is above 2,000 feet (610 m) in elevation.	***City of Houston Amendment*** **Analysis:** ***Modification*** – Table G2413.2 and the reference to it were deleted to clarify that the code requires the actual maximum input rating of the appliances to be known and used for gas pipe sizing purposes. *CHANGE SIGNIFICANCE: Table G2413.2 in previous editions of the code provided estimates for determining the total gas demand and, ultimately, the size of the gas piping system. The designer of a gas piping system might have used the table as a starting point in cases where the actual appliance loads were unknown. Then the designer would determine the actual appliance inputs and verify that the design was adequate. The table provided estimates as a placeholder in the piping system design, and the design would have to be verified after the true loads were known. This process carries the risk that the estimate table could be relied upon solely and the piping system might be undersized in some cases. It was felt that such design guidance tables belong in a handbook rather than in a code and the table has been removed. Designers can use estimated loads if they need to, but the code should not encourage the*

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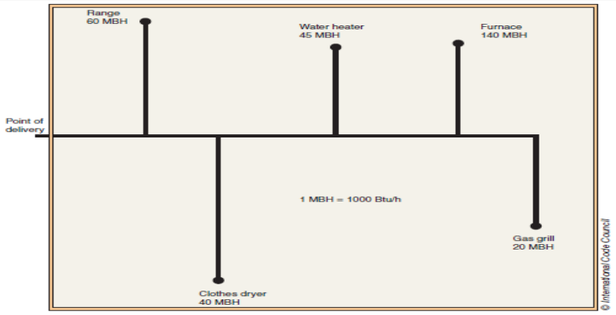
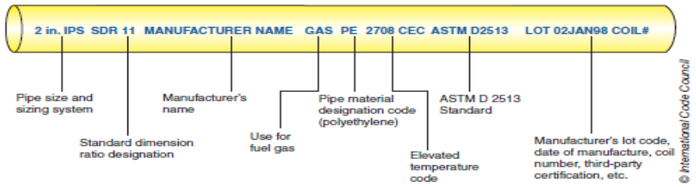
 Gas piping size is based on the actual maximum input rating of the appliances	~~TABLE G2413.2 (402.2) Approximate Gas Input for Typical Appliar~~ ~~Appliance~~ | ~~Input Btu/h (Approx.)~~ ~~Space Heating Units~~ ~~Hydronic boiler:~~ ~~Single family~~ ~~100,000~~ ~~Multifamily, per unit~~ ~~60,000~~ ~~Warm-air furnace:~~ ~~Single family~~ ~~100,000~~ ~~Multifamily, per unit~~ ~~60,000~~ *(Portions of deleted table not shown for brevity and clarity.)*	*practice. Also, it is difficult for such a table to accurately represent the many different appliances in the marketplace.* **Justification:** Approved through the ANSI process at the national code development hearings.
G2412.2 (401.2) Liquefied petroleum gas storage. The storage system for *liquefied petroleum gas* shall be designed and installed in accordance with the *International Fire Code*, ~~and~~ NFPA 58, and applicable State laws that are administered by the Texas Railroad Commission**.**	**G2412.2 (401.2) Liquefied petroleum gas storage.** The storage system for *liquefied petroleum gas* shall be designed and installed in accordance with the ~~*International*~~ *Fire Code,* ~~and~~ NFPA 58, and applicable State laws that are administered by the Texas Railroad Commission.	***City of Houston Amendment*** **Analysis:** The previous COH amendment include minor editorial changes to correlate with the Houston IRC 2015 format. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure correlation throughout the *Houston Construction Code*, and state and local government policy.
G2413.3 (402.3) Sizing. *Gas piping* shall be sized in accordance with ~~one of the following:~~ Tables G2413.4(1) through G2413.4(21). CSST piping shall be sized according to manufacturer's recommendations and the *Plumbing Code*. ~~**1.** *Pipe* sizing tables or sizing equations in accordance with Section G2413.4.~~ ~~**2.** The sizing tables included in a listed *piping* system's manufacturer's installation instructions.~~ ~~**3.** Other *approved* engineering methods.~~	**G2413.3 (402.3) Sizing.** *Gas piping* shall be sized in accordance with ~~one of the following:~~ Tables G2413.4(1) through G2413.4(21). CSST piping shall be sized according to manufacturer's recommendations and the *Plumbing Code.* ~~1. *Pipe* sizing tables or sizing equations in accordance with Section G2413.4.~~ ~~2. The sizing tables included in a *listed piping* system's manufacturer's installation instructions.~~ ~~3. Other *approved* engineered methods.~~	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy. Table G2413.2 and the reference to it were deleted to clarify that the code requires the actual maximum input rating of the appliances to be known and used for gas pipe sizing purposes.
~~**G2413.6 (402.6) Maximum design operating pressure.** The maximum design operating pressure for *piping systems* located inside buildings shall not exceed 5 pounds per square inch gauge (psig) (34 kPa gauge) except where one or more of the following conditions are met: **1.** The *piping system* is welded. **2.** The *piping* is located in a ventilated chase or otherwise enclosed for protection against accidental gas accumulation. **3.** The *piping* is a temporary installation for buildings under construction.~~	~~{EDITORIAL NOTE: DELETE SECTION G2413.6 (402.6) IN ITS ENTIRETY.}~~ ~~**G2413.6 (402.6) Maximum design operating pressure.** The maximum design operating pressure for piping systems located inside buildings shall not exceed 5 pounds per square inch gauge (psig) (34 kPa gauge) except where one or more of the following conditions are met: **1.** The piping system is welded. **2.** The piping is located in a ventilated chase or otherwise enclosed for protection against accidental gas accumulation. **3.** The piping is a temporary installation for buildings under construction.~~	***City of Houston Amendment*** **Analysis:** The previous COH amendment is replaced with an editorial note with the same result. ***No change to the previous code requirements or code intent.*** **Justification:** In lieu of striking out the text of the section, the committee recommends adding an editorial note to save money.
G2414.6 (403.6) Plastic pipe, tubing and fittings. Polyethylene plastic pipe, tubing and fittings used to supply fuel gas shall conform to the 2009 edition of ASTM D 2513. Such pipe shall be marked "Gas" and "ASTM D 2513." Plastic pipe, tubing and fittings, other than polyethylene, shall be identified and conform to the 2008 edition of ASTM D 2513. Such pipe shall be marked "Gas" and "ASTM D 2513."	**G2414.6 (403.6) Plastic Pipe, Tubing and Fittings.** Polyethylene plastic pipe, tubing and fittings used to supply fuel gas shall conform to ASTM D 2513. Such pipe shall be marked "Gas" and "ASTM D 2513." Plastic pipe, tubing and fittings, other than polyethylene, shall be identified and conform to the 2008 edition of ASTM D 2513. Such pipe shall be marked "Gas" and "ASTM D 2513." Polyvinyl chloride (PVC) and chlorinated polyvinyl chloride (CPVC) plastic pipe, tubing and fittings shall not be used to supply fuel gas.	***City of Houston Amendment*** **Analysis:** ***Modification*** – PVC and CPVC pipe are expressly prohibited materials for supplying fuel gas. *CHANGE SIGNIFICANCE: The code now references the 2013 edition of ASTM D 2513, which has been revised to address only polyethylene (PE) plastic pipe, tubing and fittings, whereas the 2009 edition addressed all plastic materials. The code had to maintain a reference to the 2008 edition of the standard to address plastics other than PE such as polyamide (nylon). It was determined that polyamide pipe is currently used to supply fuel gas; however, PVC and CPVC are not. Further, it was decided that because of the brittle nature of PVC and CPVC, especially at low temperatures, these materials are not suitable for conveying fuel gas. Rather than be silent, the code now prohibits what the marketplace has failed to embrace as a viable material for the conveyance of fuel gas.*

	 Approved polyethylene gas piping with markings in accordance with the code and ASTM D 2513	**Justification:** Approved through the ANSI process at the national code development hearings.
G2414.10.4 (403.10.4) Metallic fittings. Metallic fittings, including *valves*, strainers and filters shall comply with the following: **1.** Fittings used with steel or wrought-iron *pipe* shall be steel, brass, bronze, malleable iron, ductile iron or cast iron. **2.** Fittings used with copper or brass *pipe* shall be copper, brass or bronze. **3.** Brass or bronze fittings, if exposed to soil, shall have a minimum 80-percent copper content. **4.** Cast-iron bushings shall be prohibited. **45.** Special fittings. Fittings such as couplings, proprietary-type joints, saddle tees, gland-type compression fittings, and flared, flareless or compression-type *tubing* fittings shall be: used within the fitting manufacturer's pressure-temperature recommendations; used within the service conditions anticipated with respect to vibration, fatigue, thermal expansion, or contraction; installed or braced to prevent separation of the joint by gas pressure or external physical damage; and shall be *approved*.	**G2414.10.4 (403.10.4) Metallic fittings.** Metallic fittings~~,~~ shall comply with the following: **1.** Fittings used with steel or wrought-iron *pipe* shall be steel, copper alloy, malleable iron, or cast iron. **2.** Fittings used with copper or copper alloy *pipe* shall be copper or copper alloy. **3.** Brass or bronze fittings, if exposed to soil, shall have a minimum 80-percent copper content. **34.** Cast-iron bushings shall be prohibited. **45.** Special fittings. Fittings such as couplings, proprietary-type joints, saddle tees, gland-type compression fittings, and flared, flareless and compression-type *tubing* fittings shall be: used within the fitting manufacturer's pressure-temperature recommendations; used within the service conditions anticipated with respect to vibration, fatigue, thermal expansion, and contraction; and shall be *approved.* **56.** Where pipe fittings are drilled and tapped in the field, the operation shall be in accordance with all the following: **56.1.** The operation shall be performed on systems having operating pressures of 5 psi (34.5 kPa) or less. **56.2.** The operation shall be performed by the gas supplier or the gas supplier's designated representative. **56.3.** The drilling and tapping operation shall be performed in accordance with written procedures prepared by the gas supplier. **56.4.** The fittings shall be located outdoors. **56.5.** The tapped fitting assembly shall be inspected and proven to be free of leakage.	***City of Houston Amendment*** **Analysis:** The previous model code of IRC 2012 Section G2414.10.4 is expanded in the IRC 2015 Section G2414.10.4 to include additional operational details associated with field drilled and tapped fittings. The previous COH amendment is modified to correlate with changes to the model code. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is necessary to ensure the life safety measures currently in place.
G2415.5 (404.5) Piping in concealed locations. Portions of a *piping system* installed in *concealed locations* shall not have unions, *tubing* fittings, right and left couplings, bushings, compression couplings, and swing joints made by combinations of fittings. **Exceptions:** **1.** *Tubing* joined by *brazing*. **2.** Fittings listed for use in *concealed locations*.	**G2415.5 (404.5) Fittings in concealed locations.** Fittings installed in concealed locations shall be limited to the following types: **1.** Threaded elbows, tees, and couplings. **2.** Brazed fittings. **3.** Welded fittings. **4.** Fittings *listed* to ANSI LC-1/CSA 6.26 or ANSI LC-4.	***City of Houston Amendment*** **Analysis:** ***Clarification –*** This section retains the basic intent while being completely reorganized to clarify the correct application. Threaded elbows, tees and couplings are now specifically approved for concealed locations as the code always intended. The code now provides the applicable referenced standards for fittings that are listed for concealed locations. *CHANGE SIGNIFICANCE: Rather than listing what is prohibited and having exceptions, the text of this section was reformatted to state what fittings are allowed in concealed locations. The new text lists the four types of allowed fittings: threaded elbows, tees, and couplings; brazed fittings; welded fittings; and proprietary fittings listed to ANSI LC-1 or ANSI LC-4. The fittings allowed for concealment are limited to those four types. By omission, all other types of fittings are prohibited in concealed locations. This section has caused interpretation difficulties, and the new text simply clarifies what has always been the intent. Note that in future editions of the code, Item 1 will likely be revised to add threaded plugs and caps, as this was revised in ANSI Z223.1. When the code refers to couplings, those fittings are tapered thread couplings, not the straight thread couplings that are commonly found. See Section G2414.9 in the code regarding metallic pipe threads.*

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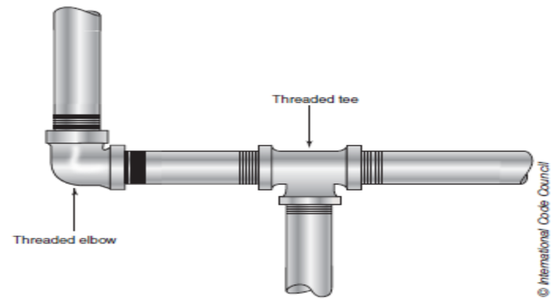
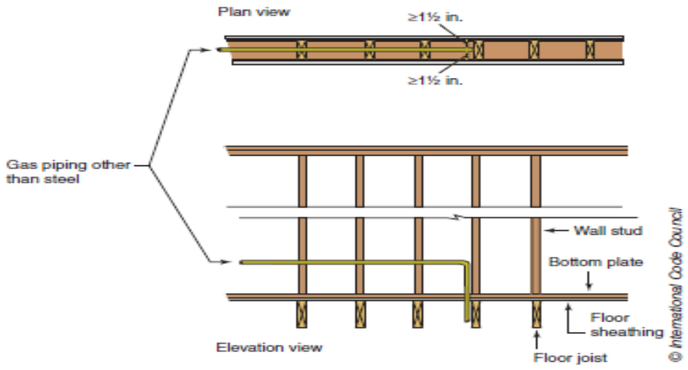
	 Threaded elbows, tees and couplings for Schedule 40 steel gas piping are permitted in concealed locations.	**Justification:** Approved through the ANSI process at the national code development hearings.
G2415.7 (404.7) Protection against physical damage. In *concealed locations*, where *piping* other than black or galvanized steel is installed through holes or notches in wood studs, joists, rafters, or similar members less than 1 1/2-inches (38 mm) from the nearest edge of the member, the *pipe* shall be protected by shield plates. Protective steel shield plates having a minimum thickness of 0.0575-inch (1.463 mm) (No. 16 Gage) shall cover the area of the pipe where the member is notched or bored and shall extend a minimum of 4 inches (102 mm) above sole plates, below top plates and to each side of a stud, joist, or rafter.  Concealed gas piping with minimum clearance of 1½ inches does not require protection.	**G2415.7 (404.7) Protection Against Physical Damage.** Where piping will be concealed within light-frame construction assemblies, the piping shall be protected against penetration by fasteners in accordance with Sections G2415.7.1 through G2415.7.3. **Exception:** Black steel piping and galvanized steel piping shall not be required to be protected. **G2415.7.1 (404.7.1) Piping Through Bored Holes or Notches.** Where piping is installed through holes or notches in framing members and the piping is located less than 1½ inches (38 mm) from the framing member face to which wall, ceiling or floor membranes will be attached, the pipe shall be protected by shield plates that cover the width of the pipe and the framing member and that extend not less than 4 inches (51 mm) to each side of the framing member. Where the framing member that the piping passes through is a bottom plate, bottom track, top plate or top track, the shield plates shall cover the framing member and extend not less than 4 inches (51 mm) above the bottom framing member and not less than 4 inches (51 mm) below the top framing member. **G2415.7.2 (404.7.2) Piping Installed in Other Locations.** Where the piping is located within a framing member and is less than 1. Inches (38 mm) from the framing member face to which wall, ceiling or floor membranes will be attached, the piping shall be protected by shield plates that cover the width and length of the piping. Where the piping is located outside of a framing member and is located less than 1. inches (38 mm) from the nearest edge of the face of the framing member to which the membrane will be attached, the piping shall be protected by shield plates that cover the width and length of the piping. **G2415.7.3 (404.7.3) Shield Plates.** Shield plates shall be of steel material having a thickness of not less than 0.0575 inch (1.463 mm) (No. 16 gage).	***City of Houston Amendment*** **Analysis:** ***Modification*** – The section on protection of piping has been completely rewritten to address more than just bored holes and notches in structural members. It now addresses piping parallel to framing members and piping within framing members. The new text requires that the protection extend well beyond the edge of members that are bored or notched. *CHANGE SIGNIFICANCE: Fuel gas tubing in concealed locations is vulnerable to penetration by fasteners used for securing finish materials. When this occurs, a leak may not develop immediately, but may show up years later due to corrosion. For that reason, piping and tubing other than Schedule 40 steel pipe must be protected from penetration by nails and screws where the pipe or tubing is less than 1. inches from the face of the member where sheathing, membranes, or finish materials (typically drywall) will be attached. If the 1.-inch dimension cannot be maintained, the code requires the installation of steel shield plates to protect the piping or tubing. This protection is necessary whether the pipe or tube is perpendicular or parallel to the framing member. If a pipe or tube is run inside of a 3.-inch "C" channel of a metal stud parallel to the direction of the stud, it is subject to penetration by screws unless the pipe or tube is. inch or less in diameter and located dead center in the stud channel. Where pipes and tubing are attached to and run parallel with the side of a framing member, penetration by nails or screws is also possible if the fastener misses the framing and the pipe or tube is less than 1. inches from either face of the stud. Extending the protection shield plate 4 inches beyond the edges of the framing member is intended to protect against fasteners that miss the member or that exit the member on an angle. To avoid having protection plates run parallel with a member, the pipe or tube could simply be placed on "standoffs" such that the pipe/tube is not less than 1. inches from the nearest edge of the member. As always, careful planning of the routing of gas piping and tubing can avoid the need for protection plates. This section pertains to piping and tubing that is concealed within wood or steel light-frame construction assemblies, which is the same scope as previous editions of the code.* **Justification:** Approved through the ANSI process at the national code development hearings.
G2415.6 (404.6) Underground penetrations prohibited. *Gas piping* shall not penetrate building foundation walls at any point below grade. *Gas piping* shall enter and exit a building at a point above grade and the annular space between the *pipe* and the wall shall be sealed at the point where it enters the building, and the sleeve shall be vented to the outside of the building.	**G2415.6 (404.6) Underground penetrations prohibited.** Gas *piping* shall not penetrate building foundation walls at any point below *grade*. Gas *piping* shall enter and exit a building at a point above grade and the annular space between the *pipe* and the wall shall be sealed at a point where the *pipe* enters the building~~, and the sleeve shall be vented to the outside of the building~~.	***City of Houston Amendment*** **Analysis:** The previous IRC 2012 COH amendment was modified to delete requirements that are already included in other volumes of the *Houston Construction Code*. The extended text of the previous COH amendment is no longer needed as specific details are identified in HPC handouts. ***No change to the previous code requirements or code intent.*** **Justification:** Reduce unnecessary COH amendments for model code. The original extended amendment is no longer needed as the details of our

		requirements are addressed in other volumes of the *Houston Construction Code* and HPC handouts.
G2415.11 (404.11) Protection against corrosion. Metallic *pipe* or *tubing* exposed to corrosive action, such as soil condition or moisture, shall be protected in an *approved* manner. Zinc coatings (galvanizing) shall not be deemed adequate protection for *gas piping* underground. Where dissimilar metals are joined ~~underground~~, an insulating coupling or fitting shall be used. *Piping* shall not be laid in contact with cinders.	**G2415.11 (404.11) Protection against corrosion.** Metallic pipe or *tubing* exposed to corrosive action, such as soil condition or moisture, shall be protected in an *approved* manner. Zinc coatings (galvanizing) shall not be deemed adequate protection for *gas piping* underground. Where dissimilar metals are joined ~~underground~~, an insulating coupling or fitting shall be used. *Piping* shall not be laid in contact with cinders.	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This COH amendment is retained to prevent corrosion of materials due to regionally specific conditions.
G2415.12.1 (404.12.1) Individual outside appliances. Individual lines to outside lights, grills or other *appliances* shall be installed a minimum of 12 inches (304.56 mm) ~~8 inches (203 mm)~~ below finished grade, provided that such installation is *approved* and is installed in locations not susceptible to physical damage.	**G2415.12.1 (404.12.1) Individual outside appliances.** Individual lines to outdoor lights, grills, or other *appliances* shall be installed not less than 12 inches (304.56 mm) ~~8 inches (203 mm)~~ below finished grade, provided that such installation is *approved* and is installed in locations not susceptible to physical damage.	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** The COH amendment is retained to correlate with other volumes of the *Houston Construction Code,* to reduce physical damage of below grade materials, and to promote uniformity in depth.
G2415.17.1 (404.17.1) Limitations. Plastic *pipe* shall be installed outdoors underground only, with a minimum depth of 18 inches of cover. Plastic *pipe* shall not be used within or under any building or slab or be operated at pressures greater than 100 psig (689 kPa) for natural gas or 30 psig (207 kPa) for LP-gas. **Exceptions:** **1.** Plastic *pipe* shall be permitted to terminate above ground outside of buildings where installed in premanufactured *anode less risers* or service head adapter risers that are installed in accordance with the manufacturer's installation instructions. **2.** Plastic *pipe* shall be permitted to terminate with a wall head adapter within buildings where the plastic pipe is inserted in a *piping* material for *fuel gas* use in buildings. **3.** Plastic pipe shall be permitted under outdoor patio, walkway, and driveway slabs provided that the burial depth complies with Section G2415.10.	**G2415.17.1 (404.17.1) Limitations.** Plastic pipe shall be installed outdoors underground only, with a minimum depth of 18 inches of cover. Plastic pipe shall not be used within or under any building or slab or be operated at pressures greater than 100 psig (689 kPa) for natural gas or 30 psig (207 kPa) for LP gas. **Exceptions:** **1.** Plastic pipe shall be permitted to terminate above ground outside of buildings where installed in premanufactured *anode less risers* or service head adapter risers that are installed in accordance with the manufacturer's installation instructions. **2.** Plastic pipe shall be permitted to terminate with a wall head adapter within buildings where the plastic pipe is inserted in a *piping* material for *fuel gas* use in buildings. **3.** Plastic pipe shall be permitted under outdoor patio, walkway, and driveway slabs provided that the burial depth complies with Section G2415.10.	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** The committee recommends keeping this amendment to provide basic specifications that are applicable to all plastic pipes located outdoors.
G2417.1.1 (406.1.1) Inspections. Inspection shall consist of visual examination, during or after manufacture, fabrication, assembly ~~or~~ and *pressure tests* as appropriate. The *building official* shall make the following inspections and either approve the portion of the work as completed or notify the permit holder that the same fails to comply with this code: **1. Rough Piping Inspection.** This inspection shall be made after all gas piping authorized by the *permit* has been installed and before any such piping has been covered or concealed, or any fixture or appliance has been attached thereto. This inspection shall include a determination that the gas piping size, material, and installation meet the requirements of this code. This inspection shall also include a pressure test. The gas piping shall pass an air pressure test of 25 psi (172 kPa) for a period of 15 minutes with no perceptible drop in pressure. For metal welded piping and for piping carrying gas at pressure in excess of 14 inches (355.6 mm) water column pressure, the test pressure shall	**G2417.1.1 (406.1.1) Inspections.** Inspections shall consist of visual examination, during or after manufacture, fabrication, assembly ~~or~~ and *pressure tests*. The *building official* shall make the following inspections and either approve the portion of the work as completed or notify the *permit* holder that the same fails to comply with this code: 1. **Rough piping inspection.** This inspection shall be made after all gas piping authorized by the *permit* has been installed and before any such piping has been covered or concealed, or any fixture or *appliance* has been attached thereto. This inspection shall include a determination that the gas piping size, material, and installation meet the requirements of this code. This inspection shall also include a pressure test in which the gas piping shall pass an air pressure test of 25 psi (172 kPa) for a period of 15 minutes with no perceptible drop in pressure. For metal welded piping and for piping carrying gas at pressure greater than 14 inches (355.6 mm) water column pressure, the test pressure shall	***City of Houston Amendment*** **Analysis:** The previous COH amendment includes minor editorial changes. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.

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not be less than 100 psi (689 kPa) for 30 minutes. These tests shall be made using air, CO, or nitrogen pressure only and shall be made in the presence of the inspector. All necessary apparatus for conducting tests shall be furnished by the permit holder. **2. Final Piping Inspection**. This inspection shall be made after all piping authorized by the *permit* has been installed and after all portions thereof which are to be covered or concealed are so concealed and after all fixtures, appliances, or shutoff valves have been attached thereto, and after the completed system is ready to be put in service. This inspection shall include an air, CO, or nitrogen pressure test at a pressure measured with a manometer or slope gauge for a period of not less than 15 minutes, with no perceptible drop in pressure. The test pressure shall not be less than twice the pressure that the system will be subjected to when in service. These tests shall be made in the presence of the inspector. All necessary apparatus for conducting tests shall be furnished by the permit holder. A final inspection shall be required for all gas systems that require a *permit* as defined in the *Plumbing Code*. For annual gas tests and gas turn-ons, the tests shall be done at the pressure required for the final gas inspection.	not be less than 100 psi (689 kPa) for 30 minutes. These tests shall be made using air, CO, or nitrogen pressure only and shall be made in the presence of the inspector. All necessary apparatus for conducting tests shall be furnished by the *permit* holder. 2. **Final piping inspection.** This inspection shall be made after all piping authorized by the *permit* has been installed and after all portions are covered or concealed, after all fixtures, *appliances* or shutoff valves have been attached, before any fixture, appliance, or shutoff valve has been attached thereto and after the completed system is ready to be put in service. This inspection shall include an air, CO, or nitrogen pressure test at a pressure measured with a manometer or slope gauge for a period of not less than 15 minutes with no perceptible drop in pressure. The test pressure shall not be less than twice the pressure that the system will be subjected to when in service. These tests shall be made in the presence of the inspector. All necessary apparatus for conducting tests shall be furnished by the *permit* holder. A final inspection shall be required for all gas systems that require a *permit* as defined in the *Plumbing Code*. For annual gas tests and gas turn-ons, the tests shall be done at the pressure required for the final gas inspection.	
G2417.4 (406.4) Test pressure measurement. Test pressure shall be measured with a manometer or with ~~a~~ an *approved* pressure-measuring device designed and calibrated to read, record, or indicate a pressure loss caused by leakage during the *pressure test* period. The source of pressure shall be isolated before the *pressure tests* are made. Mechanical gauges used to measure test pressures shall have a range such that the highest end of the scale is not greater than five times the test pressure.	**G2417.4 (406.4) Test pressure measurement.** Test pressure shall be measured with a manometer or with an approved alternative pressure-measuring device designed and calibrated to read, record, or indicate a pressure loss caused by leakage during the *pressure test* period. The source of pressure shall be isolated before the *pressure tests* are made. Mechanical gauges used to measure test pressures shall have a range such that the highest end of the scale is not greater than five times the test pressure. Test gauges shall have a pressure range not greater than twice the pressure applied.	***City of Houston Amendment*** **Analysis:** The existing amendment was modified for clarity and to include provisions for an alternative measuring device. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is necessary to continue established life safety requirements.

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G2417.4.1 (406.4.1) Test pressure. The test pressure to be used shall be not less than one and one-half times the proposed maximum working pressure, but not less than 3 psig (20 kPa gauge), irrespective of design pressure. Where the test pressure exceeds 125 psig (862 kPa gauge), the test pressure shall not exceed a value that produces a hoop stress in the *piping* greater than 50 percent of the specified minimum yield strength of the *pipe*. The following alternative pressure measuring devices are *approved*: 1. **Low Pressure Systems.** A low-pressure diaphragm gauge with a minimum dial size of 3½ inches (88.9 mm) with a set hand and a pressure range not to exceed 6 psi with 1/10-pound (0.69 kPa) increments. The minimum test pressure shall not be less than 3 psi, and the maximum test pressure to be applied shall not exceed 4 psi. 2. **Medium Pressure Systems.** A diaphragm type pressure gauge with a minimum dial size of 3½ inches (88.9 mm) with a set hand and a pressure range not to exceed 20 psi with 2/10-pound (1.38 kPa) increments. The minimum test pressure shall not be less than 10 psi, and the maximum test pressure shall not exceed 12 psi. 3. **High Pressure Systems.** Gauges for high pressure test shall be as follows: **a.** Required pressure tests that exceed 10 pounds (69 kPa) but do not exceed 100 pounds (689 kPa) shall be performed with gauges that have 1 pound (6.9 kPa) increments or less. **b.** Required pressure tests that exceed 100 pounds (689 kPa) shall be performed with gauges incremented for 2 percent or less of the required test pressure. Test gauges shall have a pressure range not greater than twice the test pressure applied.	**G2417.4.1 (406.4.1) Test pressure.** The test pressure to be used shall be not less than 1½ times the proposed maximum working pressure, but not less than 3 psig (20 kPa gauge), irrespective of design pressure. Where the test pressure exceeds 125 psig (862 kPa gauge), the test pressure shall not exceed a value that produces a hoop stress in the *piping* greater than 50 percent of the specified minimum yield strength of the pipe. **G2417.4.2 (406.4.2) Test duration.** The test duration shall be not less than ~~10~~ 15 minutes. **G2417.4.3 (406.4.3) Approved Alternative Pressure Measuring Devices.** The following alternative pressure measuring devices are *approved*: **1.** **Low pressure systems.** A low-pressure diaphragm gauge with a minimum dial size of 3½ inches (88.9 mm) with a set hand and a pressure range not to exceed 6 psi with 1/10-pound (0.69 kPa) increments. The minimum test pressure shall not be less than 3 psi, and the maximum test pressure to be applied shall not exceed 4 psi. **2.** **Medium pressure systems.** A diaphragm type pressure gauge with a minimum dial size of 3½ inches (88.9 mm) with a set hand and a pressure range not to exceed 20 psi with 2/10-pound (1.38 kPa) increments. The minimum test pressure shall not be less than 10 psi, and the maximum test pressure shall not exceed 12 psi. **3.** **High pressure systems.** Gauges for high pressure tests shall be as follows: **3.1** Required pressure tests that exceed 10 pounds (69 kPa) but do not exceed 100 pounds (689 kPa) shall be performed with gauges that have 1 pound (6.9 kPa) increments or less. **3.2** Required pressure tests that exceed 100 pounds (689 kPa) shall be performed with gauges incremented for 2 percent or less of the required test pressure.	***City of Houston Amendment*** **Analysis:** The provisions of IRC 2012 Section G2417.4.1 was split up into several sections in the 2015 IRC. No changes were made to the previous COH amendment. The COH amendment was relocated from IRC 2012 G2417.4.1 to IRC 2015 Section G2417.4.3. The requirements for test duration was relocated from IRC 2012 Section G2417.1.1 to IRC 2015 Section G2417.4.2 with a COH amendment specifically addressing the required test duration. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is necessary to continue established life safety requirements associated with pipe leak testing using pressure. Minor editorial changes from Legal per 10-12-2021 blackline file.
G2418.2 (407.2) Design and installation. *Piping* shall be supported with metal *pipe* hooks, metal *pipe* straps, metal bands, metal brackets, metal hangers or building structural components suitable for the size of *piping*, of adequate strength and quality, and located at intervals so as to prevent or damp out excessive vibration. *Piping* shall be anchored to prevent undue strains on connected *appliances* and shall not be supported by other *piping* or *equipment*. *Pipe* hangers and supports shall conform to the requirements of MSS SP-58 and shall be spaced in accordance with Section G2424. Supports, hangers and anchors shall be installed so as not to interfere with the free expansion and contraction of the *piping* between anchors. All parts of the supporting *equipment* shall be designed and installed so that they will not be disengaged by movement of the supported *piping*.	**G2418.2 (407.2) Design and installation.** *Piping* shall be supported with metal pipe hooks, metal pipe straps, metal bands, metal brackets, metal hangers or building structural components suitable for the size of *piping*, of adequate strength and quality, and located at intervals to prevent or damp out excessive vibration. *Piping* shall be anchored to prevent undue strains on connected *appliances* and shall not be supported by other *piping* or *equipment*. Pipe hangers and supports shall conform to the requirements of MSS SP-58 and shall be spaced in accordance with Section G2424. Supports, hangers and anchors shall be installed so as not to interfere with the free expansion and contraction of the *piping* between anchors. All parts of the supporting *equipment* shall be designed and installed so that they will not be disengaged by movement of the supported *piping.*	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
G2419.4 (408.4) Sediment trap. Where a sediment trap is not incorporated as part of the appliance, a sediment trap shall be installed downstream of the appliance shutoff valve as close to the inlet of the appliance as practical. The sediment trap shall be either a tee fitting having a capped nipple ~~of any length installed vertically~~ in the bottom most opening of the tee, as illustrated in Figure G2419.4 or other device approved as an effective sediment trap. Illuminating appliances, ranges, clothes dryers, decorative vented appliances for installation in vented fireplaces, gas fireplaces, and outdoor grills need not be so equipped.	**G2419.4 (408.4) Sediment trap.** Where a sediment trap is not incorporated as part of the appliance, a sediment trap shall be installed downstream of the appliance shutoff valve as close to the inlet of the appliance as practical. The sediment trap shall be either a tee fitting having a capped nipple ~~of any length installed vertically~~ in the bottommost opening of the tee as illustrated in Figure G2419.4 or other device approved as an effective sediment trap. Illuminating appliances, ranges, clothes dryers, decorative vented appliances for installation in vented fireplaces, gas fireplaces and outdoor grills need not be so equipped.	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.

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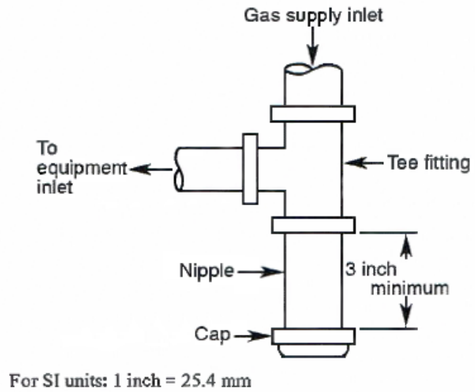
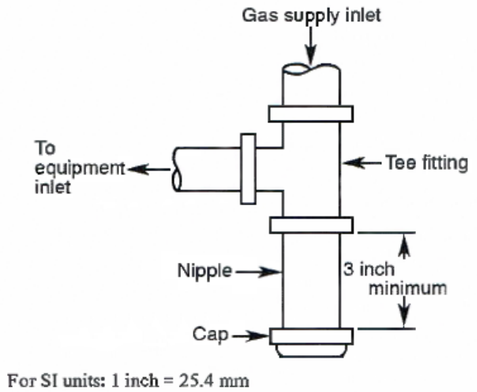
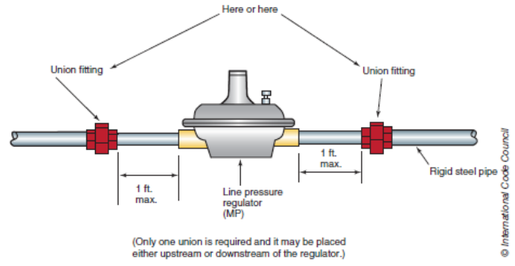
{EDITORIAL NOTE: DELETE FIGURE 2419.4 AND REPLACE WITH FIGURE 1211.8 OF THE *2012 UNIFORM PLUMBING CODE*.}	**{EDITORIAL NOTE:** DELETE FIGURE G2419.4 AND REPLACE WITH FIGURE 1211.8 OF THE 2012 *UNIFORM PLUMBING CODE*.}	
		***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
FIGURE 2419.4 **METHOD OF INSTALLING A TEE FITTING SEDIMENT TRAP** **[NFPA 54: FIGURE 9.6.7]**	**FIGURE G2419.4 ~~(408.4)~~** **METHOD OF INSTALLING A TEE FITTING SEDIMENT TRAP** **[NFPA 54: FIGURE 9.6.7]**	
G2421.2 (410.2) MP Regulators. MP pressure regulators shall comply with the following: **1.** The MP regulator shall be approved and shall be suitable for the inlet and outlet gas pressures for the application. **2.** The MP regulator shall maintain a reduced outlet pressure under lockup (no-flow) conditions. **3.** The capacity of the MP regulator, determined by published ratings of its manufacturer, shall be adequate to supply the appliances served. **4.** The MP pressure regulator shall be provided with access. Where located indoors, the regulator shall be vented to the outdoors or shall be equipped with a leak-limiting device, in either case complying with Section G2421.3. **5.** A tee fitting with one opening capped or plugged shall be installed between the MP regulator and its upstream shutoff valve. Such tee fitting shall be positioned to allow connection of a pressure-measuring instrument and to serve as a sediment trap. **6.** A tee fitting with one opening capped or plugged shall be installed not less than 10 pipe diameters downstream of the MP regulator outlet. Such tee fitting shall be positioned to allow connection of a pressure-measuring instrument.	**G2421.2 (410.2) MP Regulators**. MP pressure regulators shall comply with the following: **1.** The MP regulator shall be approved and shall be suitable for the inlet and outlet gas pressures for the application. **2.** The MP regulator shall maintain a reduced outlet pressure under lockup (no-flow) conditions. **3.** The capacity of the MP regulator, determined by published ratings of its manufacturer, shall be adequate to supply the appliances served. **4.** The MP pressure regulator shall be provided with access. Where located indoors, the regulator shall be vented to the outdoors or shall be equipped with a leak-limiting device, in either case complying with Section G2421.3. **5.** A tee fitting with one opening capped or plugged shall be installed between the MP regulator and its upstream shutoff valve. Such tee fitting shall be positioned to allow connection of a pressure-measuring instrument and to serve as a sediment trap. **6.** A tee fitting with one opening capped or plugged shall be installed not less than 10 pipe diameters downstream of the MP regulator outlet. Such tee fitting shall be positioned to allow connection of a pressure-measuring instrument. **7.** Where connected to rigid piping, a union shall be installed within 1 foot (304 mm) of either side of the MP regulator.	***City of Houston Amendment*** **Analysis:** ***Modification*** – Medium-Pressure (MP) line regulators installed in rigid piping must have a union installed to allow removal of the regulator.  Union required for Medium-Pressure (MP) regulator connected to rigid piping *CHANGE SIGNIFICANCE: MP regulators are line pressure regulators that serve to reduce pressures that are above 0.5 psi and less than or equal to 5 psi, down to some lower pressure. They are typically installed in 2-psi and 5-psi gas distribution systems that serve appliances having a maximum input pressure of 0.5 psi (14 inches water column). If such regulators are installed with steel piping on the inlet and outlet side, it will be impossible to remove the regulator or isolate it without disassembling the piping system for some distance or cutting the piping. To facilitate removal or isolation of the regulator, a union fitting must be placed near the inlet or outlet side of the regulator.* **Justification:** Approved through the ANSI process at the national code development hearings.
G2422.1 (411.1) Connecting appliances. *Appliances* shall be connected to the *piping system* by one of the following: **1.** Rigid metallic pipe and fittings. **2.** Corrugated stainless-steel *tubing* (CSST) where installed in accordance with the manufacturer's instructions.	**G2422.1 (411.1) Connecting appliances.** *Appliances* shall be connected to the *piping system* by one of the following: **1.** Rigid metallic pipe and fittings. **2.** Corrugated stainless-steel *tubing* (CSST) where installed in accordance with the manufacturer's instructions.	***City of Houston Amendment*** **Analysis:** ***Modification*** – Where portable gas appliances are used outdoors, such as gas grills, fire pits, and patio heaters, the options for connecting to the gas distribution system are practically limited to gas hoses designed for the purpose. Such hoses must comply with ANSI Z21.54.

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3. Listed and labeled *appliance connectors* in compliance with ANSI Z21.24 and installed in accordance with the manufacturer's instructions and located entirely in the same room as the *appliance*. **4.** *Listed* and *labeled* quick-disconnect devices used in conjunction with *listed* and *labeled appliance connectors*. **5.** *Listed* and *labeled* convenience outlets used in conjunction with *listed* and *labeled appliance connectors*. **6.** *Listed* and *labeled* outdoor *appliance connectors* in compliance with ANSI Z21.75/CSA 6.27 and installed in accordance with the manufacturer's instructions. **G2422.1.5 (411.1.4) Movable appliances.** Where appliances are equipped with casters or are otherwise subject to periodic movement or relocation for purposes such as routine cleaning and maintenance, such appliances shall be connected to the supply system piping by means of an approved flexible connector designed and labeled for the application. Such flexible connectors shall be installed and protected against physical damage in accordance with the manufacturer's installation instructions.	**3.** Listed and labeled *appliance connectors* in compliance with ANSI Z21.24 and installed in accordance with the manufacturer's instructions and located entirely in the same room as the *appliance*. **4.** *Listed* and *labeled* quick-disconnect devices used in conjunction with *listed* and *labeled appliance connectors*. **5.** *Listed* and *labeled* convenience outlets used in conjunction with *listed* and *labeled appliance connectors*. **6.** *Listed* and *labeled* outdoor *appliance connectors* in compliance with ANSI Z21.75/CSA 6.27 and installed in accordance with the manufacturer's instructions. **7.** *Listed* outdoor gas hose connectors in compliance with ANSI Z21.54 used to connect portable outdoor *appliances*. The gas hose connection shall be made only in the outdoor area where the *appliance* is used and shall be to the gas *piping* supply at an *appliance* shutoff valve, a *listed* quick-disconnect device or *listed* gas convenience outlet. **G2422.1.5 (411.1.4) Movable appliances.** Where *appliances* are equipped with casters or are otherwise subject to periodic movement or relocation for purposes such as routine cleaning and maintenance, such *appliances* shall be connected to the supply system *piping* by means of an *appliance connector listed* as complying with ANSI Z21.69 or by means of Item 1 of Section G2422.1. Such flexible connectors shall be installed and protected against physical damage in accordance with the manufacturer's instructions.	*CHANGE SIGNIFICANCE: Methods 1 through 6 of Section G2422.1 are not designed for connecting portable appliances to the gas distribution piping system. For outdoor portable appliances, new method 7 is the only appropriate option. Outdoor gas hose connectors must be resistant to mechanical damage, possible heat exposure and the harmful effects of exposure to the weather. Connectors listed to ANSI Z21.54 are evaluated and tested for the particularly harsh environment of outdoor use. The gas hose connector must be located entirely outdoors and must be connected to the gas piping system at a point outdoors. The point of connection to the gas distribution system piping must be through a listed device that allows the hose to be readily disconnected manually or through an appliance shutoff valve. Quick-disconnect devices have safety features such as thermal shutoffs that will close the valve when exposed to high temperatures and interlocking systems that will not allow the hose to be removed until the manual gas valve is closed. The intent of new Item 7 is to address portable outdoor appliance connections and to mandate that such connectors be listed to a specific safety standard.* *Movable gas appliances in other than outdoor locations require flexible connectors listed as complying with ANSI Z21.69 installed and protected against physical damage in accordance with the manufacturer's instructions, or they must relate to rigid metallic piping as referenced in Item 1 of Section G2422.1. Previously, the code only required that movable appliances relate to approved flexible connectors.* **Justification:** Approved through the ANSI process at the national code development hearings.
G2423.1 (413.1) General. Motor fuel-dispensing facilities for CNG fuel and their operation shall be in accordance with ~~Section 413 of~~ the *International ~~Fuel Gas~~ Fire Code*.	**G2423.1 (413.1) General.** Motor fuel-dispensing facilities for CNG fuel and their operation shall be in accordance with ~~Section 413 of~~ the ~~*International Fuel Gas*~~ *Fire Code.*	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is necessary to reference the applicable code that governs additional considerations for motor fuel-dispensing facilities.
G2425.8 (501.8) Appliances not required to be vented. The following *appliances* shall not be required to be vented: **1.** Ranges. **2.** Built-in domestic cooking units listed and marked for optional venting. **3.** Hot plates and laundry stoves. **4.** *Type 1 clothes dryers* (*Type 1 clothes dryers* shall be exhausted in accordance with the requirements of Section G2439). **5.** Refrigerators. **6.** Counter *appliances*. ~~**7. Room heaters listed for unvented use.**~~ Where the *appliances* listed in Items 5 and 6 ~~through 7~~ above are installed so that the aggregate input rating exceeds 20 *Btu* per hour per *cubic foot* (207 W/m³) of volume of the room or space in which such *appliances* are installed, one or more shall be provided with venting *systems* or other *approved* means for conveying the *vent gases* to the outdoor atmosphere so that the aggregate input rating of the remaining *unvented appliances* does not exceed 20 *Btu* per hour per *cubic foot* (207 W/m³). Where the room or space in which the *appliance* is installed is directly connected to another room or space by a doorway, archway or other opening of comparable size that cannot be closed, the volume of such adjacent room or space shall be permitted to be included in the calculations.	**G2425.8 (501.8) Appliances not required to be vented.** The following *appliances* shall not be required to be vented: **1.** Ranges. **2.** Built-in domestic cooking units *listed* and marked for optional venting. **3.** Hot plates and laundry stoves. **4.** *Type 1 clothes dryers* (*Type 1 clothes dryers* shall be exhausted in accordance with the requirements of Section G2439). **5.** Refrigerators. **6.** Counter *appliances.* ~~**7. Room heaters *listed* for unvented use.**~~ Where the *appliances* listed in Items 5 and 6 ~~through 7~~ above are installed so that the aggregate input rating exceeds 20 *Btu* per hour per cubic foot (207 W/m³) of volume of the room or space in which such *appliances* are installed, one or more shall be provided with venting *systems* or other *approved* means for conveying the *vent gases* to the outdoor atmosphere so that the aggregate input rating of the remaining *unvented appliances* does not exceed 20 *Btu* per hour per cubic foot (207 W/m³). Where the room or space in which the *appliance* is installed is directly connected to another room or space by a doorway, archway or other opening of comparable size that cannot be closed, the volume of such adjacent room or space shall be permitted to be included in the calculations.	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is necessary to ensure continuing standards of life safety within the city.

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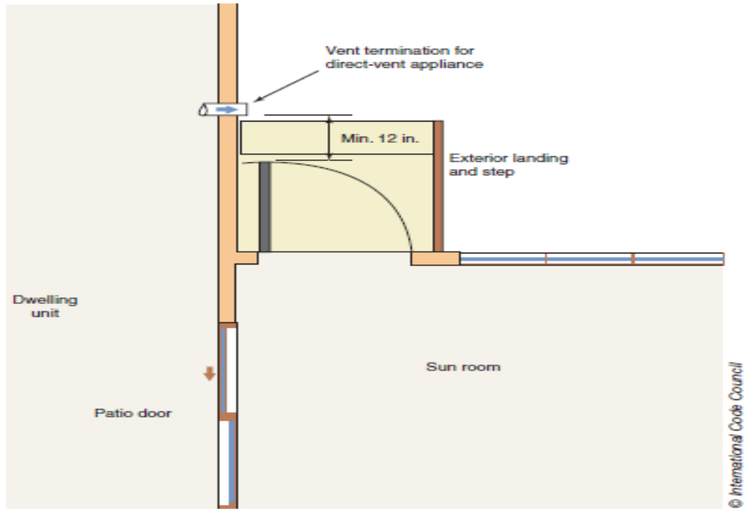
N/A

G2426.7.1 (502.7.1) Door Swing. Appliance and equipment vent terminals shall be located such that doors cannot swing within 12 inches (305 mm) horizontally of the vent terminal. Door stops or closers shall not be installed to obtain this clearance.



Vent terminals must be located so doors cannot swing within 12 inches to protect against physical damage.

City of Houston Amendment

Analysis: ***New addition –*** An appliance vent terminal is not permitted in a location within 12 inches of the arc of a swinging door. Photo illustrations provided here.

This direct-vent terminal is subject to damage from the swinging door.

CHANGE SIGNIFICANCE: Vent terminals for sidewall vented appliances, such as direct-vent gas fireplaces and fireplace heaters, direct-vent room heaters, direct-vent water heaters, furnaces and boilers are sometimes located where a side-swinging door could impact the vent terminal or swing close to the terminal. The results can be damage to the vent terminal, a fire hazard, and interference with the appliance venting and combustion air intake. Another possible scenario is where the door blocks or deflects the vent discharge such that the combustion products are pulled back into the combustion air intake resulting in excessive carbon monoxide production, serious appliance malfunction, and sooting. Door stops and closer devices cannot be depended upon because they are easily defeated or removed.

Justification: Approved through the ANSI process at the national code development hearings.

G2427.4.1 (503.4.1) Plastic piping. Plastic *piping* used for venting *appliances* listed for use with such venting materials shall be *approved*.

G2427.6.8.3 (503.6.9.3) Category II, III and IV appliances. The sizing of gas vents for Category II, III and IV appliances shall be in accordance with the appliance manufacturer's instructions.

G2427.4.1 (503.4.1) Plastic piping. Where plastic piping is used to vent an appliance, the appliance shall be listed for use with such venting materials and the appliance manufacturer's installation instructions shall identify the specific plastic piping material.

G2427.6.8.3 (503.6.9.3) Category II, III and IV Appliances. The sizing of gas vents for Category II, III and IV appliances shall be in accordance with the appliance manufacturer's instructions. The sizing of plastic pipe that is specified by the appliance manufacturer as a venting material for Category II, III and IV appliances, shall be in accordance with the manufacturer's instructions.

City of Houston Amendment

Analysis: ***Modification*** – The approval of plastic pipe for venting appliances is no longer a responsibility of the building official and, instead, that responsibility rests with the appliance manufacturer and the appliance listing agency. The code previously addressed only vents, which are defined as listed and labeled factory-made products. The code is no longer silent on the sizing of plastic pipe vents that do not fall under the definition of "vent."

CHANGE SIGNIFICANCE: The previous code text did not actually require that the appliance be listed for use with specific venting system materials, although this was implied by the text and is required in the appliance standards. For appliances vented with plastic piping, the appliance manufacturer's installation instructions must clearly specify what plastic materials are required or allowed for venting an appliance. The installation instructions must be consistent with how the appliance was tested by the listing agency. The product standards for gas appliances contain various testing procedures for plastic venting systems. The appliance manufacturer determines the type of plastic vent that is suitable for venting its product, and the testing and listing agency tests the appliance with that venting system for compliance with the product standards. There must not be any uncertainty about what type of venting system is required for any appliance so that venting system failures can be avoided. Note that the definition of "vent" does not include plastic pipes such as PVC, ABS and CPVC because such pipes are not currently listed as factory built venting systems. The PVC, ABS and CPVC pipe manufactures do not recommend that their pipe be used for appliance venting because such products are not currently listed for such applications. There are polypropylene venting systems on the market that are listed to UL 1738 as appliance venting systems, and they do fall under the definition of "vent." Because plastic pipes such PVC, ABS and CPVC plumbing pipes are not listed and labeled as appliance vents (see definition of "vent"), the code was silent on how to size such pipes. The sizing is covered in the appliance manufacturer's instructions, and the code requires compliance with such instructions. For consistency, Section G2427.6.8.3 was modified to address sizing of both listed vents and unlisted materials used as vents.

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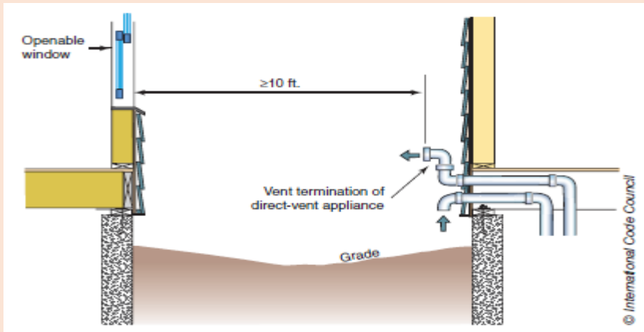
		Justification: Approved through the ANSI process at the national code development hearings.
G2427.8 (503.8) Venting system termination location. The location of venting system terminations shall comply with the following (see Appendix C): **1.** A *mechanical draft* venting system shall terminate at least 3 feet (914 mm) above any forced-air inlet located within 10 feet (3048 mm). **Exceptions:** **1.** This provision shall not apply to the *combustion air* intake of a direct-vent *appliance*. **2.** This provision shall not apply to the separation of the integral outdoor air inlet and flue gas discharge of listed outdoor *appliances*. **2.** A *mechanical draft* venting system, excluding *direct* vent *appliances*, shall terminate at least 4 feet (1219 mm) below, 4 feet (1219 mm) horizontally from, or 1 foot (305 mm) above any door, operable window, or gravity air inlet into any building. The bottom of the vent terminal shall be located at least 12 inches (305 mm) above finished ground level. **3.** The vent terminal of a *direct*-vent *appliance* with an input of 10,000 *Btu* per hour (3 kW) or less shall be located at least 6 inches (152 mm) from any air opening into a building, and such an *appliance* with an input over 10,000 *Btu* per hour (3 kW) but not over 50,000 *Btu* per hour (14.7 kW) shall be installed with a 9-inch (230 mm) vent termination *clearance*, and an *appliance* with an input over 50,000 *Btu*/h (14.7 kW) shall have at least a 12-inch (305 mm) vent termination *clearance*. The bottom of the vent terminal and the air intake shall be located at least 12 inches (305 mm) above grade finished ground level. **4.** Through-the-wall vents for Category II and IV *appliances* and noncategorized condensing *appliances* shall not terminate over public walkways or over an area where *condensate* or vapor could create a nuisance or hazard or could be detrimental to the operation of *regulators, relief valves*, or other *equipment*. Where local experience indicates that *condensate* is a problem with Category I and III *appliances*, this provision shall also apply. Drains for *condensate* shall be installed in accordance with the appliance and vent manufacturer's installation instructions.	**G2427.8 (503.8) Venting System Termination Location.** The location of venting system terminations shall comply with the following (see Appendix C): **1.** A mechanical draft venting system shall terminate not less than 3 feet (914 mm) above any forced-air inlet located within 10 feet (3,048 mm). **Exceptions:** **1.** This provision shall not apply to the combustion air intake of a direct-vent appliance. **2.** This provision shall not apply to the separation of the integral outdoor air inlet and flue gas discharge of listed outdoor appliances. **2.** A mechanical draft venting system, excluding direct-vent appliances, shall terminate not less than 4 feet (1,219 mm) below, 4 feet (1,219 mm) horizontally from, or 1 foot (305 mm) above any door, operable window, or gravity air inlet into any building. The bottom of the vent terminal shall be located not less than 12 inches (305 mm) above finished ground level. **3.** The vent terminal of a direct-vent appliance with an input of 10,000 Btu per hour (3 kW) or less shall be located at least not less than 6 inches (152 mm) from any air opening into a building. Such an appliance with an input over 10,000 Btu per hour (3 kW) but not over 50,000 Btu per hour (14.7 kW) shall be installed with a 9-inch (230 mm) vent termination clearance, and an appliance with an input over 50,000 Btu per hour (14.7 kW) shall have not less than a 12-inch (305 mm) vent termination clearance. The bottom of the vent terminal and the air intake shall be located not less than 12 inches (305 mm) above finished ground level. **4.** Through-the-wall vents for Category II and IV appliances and noncategorized condensing appliances shall not terminate over public walkways or over an area where condensate or vapor could create a nuisance or hazard or could be detrimental to the operation of regulators, relief valves or other equipment. Where local experience indicates that condensate is a problem with Category I and III appliances, this provision shall also apply. Drains for condensate shall be installed in accordance with the appliance and vent manufacturers' instructions. **5.** Vent systems for Category IV appliances that terminate through an outside wall of a building and discharge flue gases perpendicular to the adjacent wall shall be located not less than 10 feet (3,048 mm) horizontally from an operable opening in an adjacent building. This requirement shall not apply to vent terminals that are 2 feet (607 mm) or more above or 25 feet (7,620 mm) or more below operable openings.	***City of Houston Amendment*** **Analysis:** ***Modification*** – New text addresses the location of sidewall vent terminals with respect to adjoining buildings. A 10-foot separation is required when a vent discharges in the direction of an opening in an adjacent building.  A minimum 10-foot horizontal separation is required between a vent terminal and an opening of an adjacent building. *CHANGE SIGNIFICANCE: The code now addresses a common situation where dwellings are located close to each other, and sidewall-vented appliances are installed with the vent terminals directed toward the neighboring home. The concern is that combustion gases will enter the adjacent building through openings in the exterior walls that face the appliance vent terminal. This section applies only to Category IV (condensing) appliances that are sidewall vented with stainless steel or plastic vents. Computer simulations were conducted as part of a research project and the results indicated that in many scenarios, the combustion products would impinge on the neighboring building. Many factors impact the simulated scenarios, including wind speed and direction, the height of the adjacent buildings and the type of vent terminal (e.g., straight pipe, tee fitting, deflector cap, or directional fitting). If the appliance vent terminal is a straight open-ended pipe, and that pipe is perpendicular to the wall it passes through, it creates a worst-case scenario that the new provision addresses. This scenario is the most common and the most likely to project combustion gases far enough to be a potential danger to the neighbors. The research project suggested that vent terminals that utilize a tee fitting outlet or a deflector cap, or that are directed at some angles downward, are much less likely to create a nuisance or hazard to the neighbors because the combustions gases disperse and lack the velocity to impinge on the adjacent building.* **Justification:** Approved through the ANSI process at the national code development hearings.
G2439.4 (614.5) Makeup air. Installations exhausting more than 200 cfm (0.09 m3/s) shall be provided with *makeup air*. Where a closet is designed for the installation of a *clothes dryer*, an opening having an area of not less than 100 square inches (0.0645 m2) for *makeup air* shall be provided in the closet enclosure, or *makeup air* shall be provided by other *approved* means.	**G2439.4 (614.5) Dryer Exhaust Duct Power Ventilators.** Domestic dryer exhaust duct power ventilators shall be listed and labeled to UL 705 for use in dryer exhaust duct systems. The dryer exhaust duct power ventilator shall be installed in accordance with the manufacturer's instructions. ~~**G2439.5 (614.6)**~~ **G2439.7 (614.8) Domestic Clothes Dryer Exhaust Ducts.** Exhaust ducts for domestic clothes dryers shall conform to the requirements of Sections ~~G2439.5.1~~ G2439.7.1 through ~~G2439.5.7~~ G2439.7.6.	***City of Houston Amendment*** **Analysis:** ***Modification*** – New text recognizes the use of dryer exhaust duct power ventilators (DEDPVs) to increase the allowable exhaust duct length for clothes dryers. A permanent label identifying the concealed length of dryer exhaust duct is no longer required where the equivalent duct length does not exceed 35 feet. For dryer exhaust duct exceeding 35 feet, a label or tag is required whether the duct is concealed or not. Instead of prohibiting all duct

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G2439.5 (614.6) Domestic clothes dryer exhaust ducts. Exhaust ducts for domestic *clothes dryers* shall conform to the requirements of Sections G2439.5.1 through G2439.5.7.

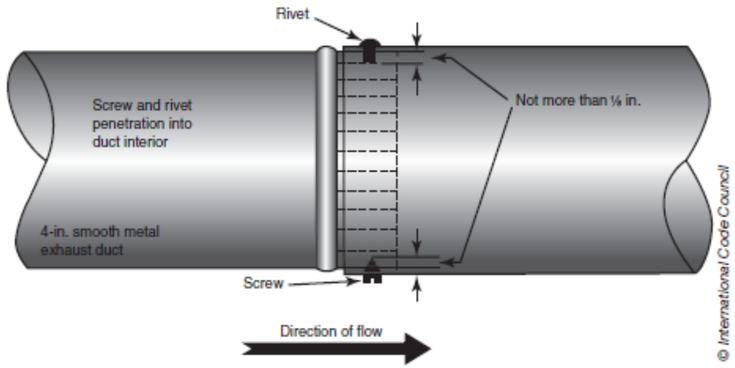
G2439.5.2 (614.6.2) Duct installation. Exhaust ducts shall be supported at 4-foot (1219 mm) intervals and secured in place. The insert end of the duct shall extend into the adjoining duct or fitting in the direction of airflow. Ducts shall not be joined with screws or similar fasteners that protrude into the inside of the duct.

~~G2439.5.2 (614.6.2)~~ **G2439.7.2 (614.8.2) Duct Installation.** Exhaust ducts shall be supported at 4-foot (1219 mm) intervals and secured in place. The insert end of the duct shall extend into the adjoining duct or fitting in the direction of airflow. Ducts shall not be joined with screws or similar fasteners that protrude more than inch (3.2 mm) into the inside of the duct.

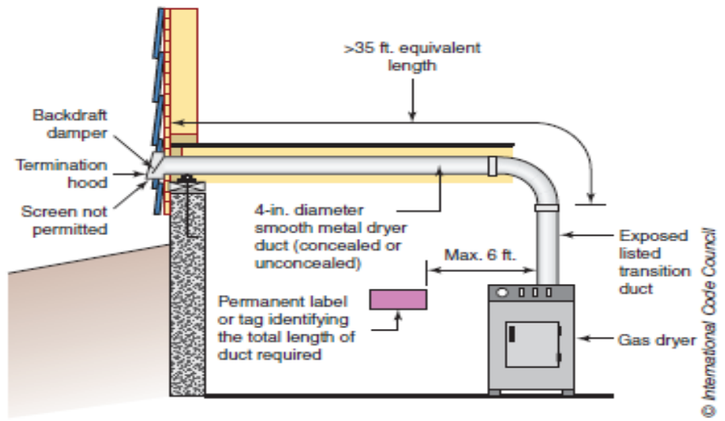
G2439.7.4.3 (614.8.4.3) Dryer Exhaust Duct Power Ventilator Length. The maximum length of the exhaust duct shall be determined by the dryer exhaust duct power ventilator manufacturer's installation instructions.

~~G2439.5.6 (614.6.5)~~ **G2439.7.5 (614.8.5) Length Identification.** Where the exhaust duct ~~is concealed within the building construction~~ equivalent length exceeds 35 feet (10,668 mm), the equivalent length of the exhaust duct shall be identified on a permanent label or tag. The label or tag shall be located within 6 feet (1829 mm) of the exhaust duct connection.

(No significant changes to portions of Section G2439 not shown.)



Dryer duct joints must be inserted in the direction of flow and fasteners cannot penetrate more than ⅛ inch



A length identification tag is required if the equivalent duct length exceeds 35 feet.

fasteners such as screws and rivets, the code now limits the penetration of fasteners, where installed.

CHANGE SIGNIFICANCE: The code limits the length of clothes dryer exhaust ducts to protect against potential fire hazards and to ensure that dryers efficiently discharge warm, moist air to the outdoors. Allowable length is based on the airflow capacity of modern dryers. Elbow fittings reduce the allowable length, resulting in a calculated "equivalent length" based on the additional resistance to airflow for each fitting. In addition to lint buildup, excessive duct length creates moisture and maintenance problems, and increases drying times causing the dryer to be inefficient and waste energy.

Previous editions of the code did not recognize dryer exhaust duct power ventilators (DEDPVs) as an option for clothes dryer installations. DEDPVs are typically referred to as "dryer booster fans" in the marketplace, because they "boost" or increase the airflow of the dryer discharge. Greater airflow increases the distance that the discharge air can be effectively pushed to the outdoors. Prior to the 2015 code, the two options for determining the maximum exhaust duct length were to comply with the prescriptive limit of 35 feet, a conservative average for modern dryers, or to follow the clothes dryer manufacturer's instructions for length limits. If the desired location did not fall within those limits, the designer or builder was left to relocate the dryer to reduce the length of the exhaust duct. Another possible solution was to make application to the building official requesting approval to install a DEDPV under the alternative materials, design, and methods of construction provisions in Section R104.11. The 2015 IRC now specifically allows DEDPVs in clothes dryer exhaust systems to increase the equivalent length of duct.

DEDPVs are listed to a revised version of UL 705 that now contains tests and construction requirements that are specific to these devices. DEDPVs have been around for years, but until recently were not listed to a national consensus standard that was specific to these devices. The UL 705 standard contains requirements for the construction, testing, and installation of DEDPVs and requires them to be equipped with features such as interlocks, limit controls, monitoring controls, and enunciator devices to make certain that the dryers or dryer operators are aware of the operating status of the DEDPVs. The maximum length of the dryer exhaust duct is determined based on the manufacturer's instructions for the DEDPV.

The provisions for identifying the equivalent length of dryer exhaust duct first appeared in the 2009 IRC. The code has since required a permanent label or tag be installed within 6 feet of the dryer when the duct was concealed behind finish materials. The purpose was to alert occupants of the length of concealed duct so they could make an informed decision to install a dryer with adequate airflow capacity. This provision recognizes that homes change hands, and many dryers may be installed over the building's lifetime. The primary concern was aimed at exhaust duct systems that were based on the dryer manufacturer's instructions at the time of construction. A given dryer might have a capacity much greater than the specified length of 35 feet, the default value, when the manufacturer and model of the dryer is unknown. This change to the 2015 IRC recognizes that there is no concern if the exhaust duct does not exceed 35 feet in equivalent length and the permanent label in this case provides no benefit to the owner. In addition, the proponents reasoned that the purpose of the permanent sign is to notify the owners and installers that the dryer duct length is exceptional and that any installed dryer must be compatible with that duct of exceptional length. Therefore, the criterion for providing signage only when the duct is concealed has been removed. The code now requires a permanent label or tag when the equivalent length of the dryer exhaust duct exceeds 35 feet, whether the duct is concealed within construction.

Section G2439.3 states that fasteners used to join fittings and sections of dryer exhaust duct must not obstruct the airflow. Many times, this was interpreted as a prohibition of screws and rivets. Other times, it was taken to mean that such fasteners must not penetrate too far into the duct. The revision to Section G2439.7.2 makes it clear how Section G2439.3 is to be interpreted. A fastener protrusion of 1/8-inch or less will collect some lint, but it will be insignificant. Smooth duct walls collect lint also. The trade-off for allowing tiny amounts of lint to collect is the improved duct construction. If dryer exhaust ducts are not allowed to be mechanically fastened, the only method to prevent separation of joints is duct tape. Duct tape should never be depended upon as the sole means of securing duct systems. Duct tape is a sealing means, not a fastening means. Now such ducts can be properly and securely fastened and then sealed with tapes or mastics. Note that the IRC Section M1502 requires dryer exhaust ducts to be mechanically fastened and allows the same 1/8-inch maximum penetration.

Justification: Approved through the ANSI process at the national code development hearings.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
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G2439.5.5.1 (614.6.5.1) Specified length. The maximum length of the exhaust duct shall be 35 feet (10 668 mm) from the connection to the transition duct from the dryer to the outlet terminal. Where fittings are used, the maximum length of the exhaust duct shall be reduced in accordance with Table G2439.5.5.1. **Exception:** Listed booster fans installed per manufacturers specifications may be provided to extend the maximum length of exhaust duct.	**G2439.7.4.1 (614.8.4.1) Specified length.** The maximum length of the exhaust duct shall be 35 feet (10,668 mm) from the connection to the transition duct from the dryer to the outlet terminal. Where fittings are used, the maximum length of the exhaust duct shall be reduced in accordance with Table G2439.7.4.1. **Exception:** *Listed* booster fans installed per manufacturer's specifications may be provided to extend the maximum length of the exhaust duct.	***City of Houston Amendment*** **Analysis:** This amendment has been renumbered and relocated. ***No change to the previous code requirements or code intent.*** **Justification:** The amendment was renumbered and relocated from section G2439.5.5.1 IRC 2012.
G2439.5.6 (614.6.5) Length identification. Where the exhaust duct is concealed within the building construction, and overall length as specified in G2439.5.5.1 exceeds 35 feet (10 688 mm), the equivalent length of the exhaust duct shall be identified on a permanent label or tag. The label or tag shall be located within 6 feet (1829 mm) of the exhaust duct connection.	**G2439.7.5 (614.8.5) Length identification.** Where the exhaust duct is concealed within the building construction and the equivalent length exceeds 35 feet (10,668 mm), the equivalent length of the exhaust duct shall be identified on a permanent label or tag. The label or tag shall be located within 6 feet (1,829 mm) of the exhaust duct connection.	***City of Houston Amendment*** **Analysis:** This amendment has been renumbered and relocated. ***No change to the previous code requirements or code intent.*** **Justification:** The amendment was renumbered and relocated from section G2439.5.6 IRC 2012.
SECTION G2445 (621) **UNVENTED ROOM HEATERS** **G2445.1 ~~(621.1) General.~~** ~~*Unvented room heaters* shall be tested in accordance with ANSI Z 21.11.2 and shall be installed in accordance with the conditions of the listing and the manufacturer's installation instructions.~~ **Unvented.** Unvented fuel-burning room heaters and decorative appliances shall be prohibited. **{EDITOR'S NOTE: DELETE REMAINDER OF SECTION G2445.}**	**SECTION G2445 (621)** **UNVENTED ROOM HEATERS** **G2445.1 ~~(621.1) General.~~** ~~*Unvented room heaters* shall be tested in accordance with ANSI Z21.11.2 and shall be installed in accordance with the conditions of the listing and the manufacturer's instructions.~~ **Prohibited fuel-burning room heaters and decorative appliances.** Unvented fuel-burning *room heaters* and decorative *appliances* shall be prohibited. **{EDITORIAL NOTE: DELETE REMAINDER OF SECTION G2445.}**	***City of Houston Amendment*** **Analysis:** Minor editorial changes made to the previous COH amendment. Section title is the only changed. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is necessary to ensure continuing standards of life safety within the city.
G2447.2 (623.2) Prohibited location. Cooking appliances designed, tested, listed, and labeled for use in commercial occupancies shall only ~~not~~ be installed within dwelling units or within any area where domestic cooking operations occur when in compliance with the ventilation and clearance to combustibles requirements for commercial cooking appliances in the *Mechanical Code*.	**G2447.2 (623.2) Prohibited location.** Cooking appliances designed, tested, *listed,* and *labeled* for use in commercial occupancies shall only ~~not~~ be installed within dwelling units or within any area where domestic cooking operations occur when in compliance with the ventilation and clearance to combustibles requirements for commercial cooking *appliances* in the *Mechanical Code*. **Exception:** Appliances that are also *listed* as domestic cooking appliances.	***City of Houston Amendment*** **Analysis:** The model code changed to include an exception to required domestic cooking appliance in dwellings. Previous amendment was not modified. However, with the addition of the new model code exception the COH amendment is no longer needed and should be deleted in the next code cycle. *CHANGE SIGNIFICANCE: Commercial cooking appliances are prohibited in dwelling units and domestic environments because they lack special safety features that domestic appliance must possess. There are appliances built today that are listed as commercial appliances and that are also listed to the domestic appliance standard; therefore, such appliances are allowed in any occupancy. The previous code text would prohibit an appliance listed as a commercial appliance even though the appliance was dual listed as both commercial and domestic. The code text was revised to eliminate this unintended consequence.* **Justification:** This amendment was modified to provide an exception for appliances that are listed as domestic cooking appliances.

2012 Houston IRC – Part 7— Chapters 25 through 33 Plumbing	2015 Houston IRC – Part 7—Chapters 25 through 33 Plumbing	Code Analysis
Part 7—Chapters 25 through 33 Plumbing ***■ Chapter 25 Plumbing Administration; ■ Chapter 26 General Plumbing Requirements; ■ Chapter 27 Plumbing Fixtures; ■ Chapter 28 Water Heaters; ■ Chapter 29 Water Supply and Distribution; ■ Chapter 30 Sanitary Drainage; ■ Chapter 31 Vents; ■ Chapter 32 Traps; ■ Chapter 33 Storm Drainage No Changes Addressed*** *Part 7 of the IRC contains provisions for plumbing systems and begins with a chapter on the specific and unique administrative issues related to plumbing code enforcement. Subsequent chapters cover technical subjects for the overall design and installation of plumbing systems in buildings. General plumbing issues such as protection of plumbing systems from damage, piping support, and certification of products are covered in Chapter 26. The other chapters of Part 7 are specific to requirements for plumbing fixtures, water heaters, water supply and distribution, sanitary drainage, vents, traps, and storm drainage. ■* ***P2502.1, P2503.4**-Inspection and Tests for Building Sewers; **P2503.5**-Drain, Waste, and Vent Systems Testing; **P2603.2.1**-Protection Against Physical Damage; **P2603.3**-Protection Against Corrosion; **Table P2605.1**-Piping Support; **P2702.1, P2706.1**-Waste Receptors; **P2717**-Dishwashing Machines; **P2801**-Water Heater Drain Valves and Pans; **P2804.6.1**-Water Heater Relief Valve Discharge Piping; **P2901, P2910 through P2913**-Nonpotable Water Systems; **P2905**-Heated Water Distribution Systems; **P2906.2**-Lead Content of Drinking Water Pipe and Fittings; **P3003.9**-Solvent Cementing of PVC Joints; **P3005.2**-Cleanouts; **P3008.1**-Backwater Valves; **P3103.1, P3103.2**-Vent Terminals; **P3201.2**-Trap Seal Protection Against Evaporation*		

2012 Houston IRC – Chapter 25 Plumbing Administration	2015 Houston IRC – Chapter 25 Plumbing Administration	Code Analysis
P2502.1 Existing building sewers and drains. Existing *building sewers* and drains shall be used in connection with new systems when found by	**P2502.1 Existing Building Sewers and Building Drains.** ~~Existing building sewers and drains shall be used in connection with new systems when found by examination and/or test to conform to the requirements prescribed by this document.~~ Where the	***City of Houston Amendment***

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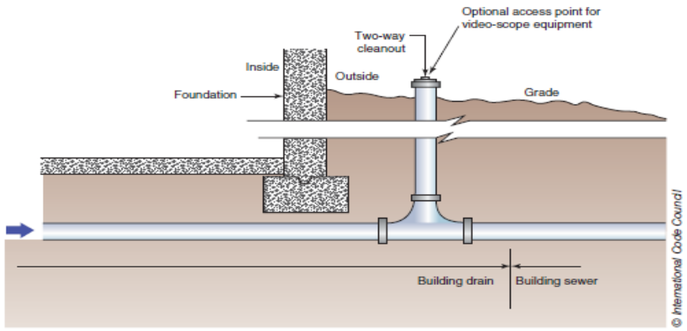
examination and/or test to conform to the requirements prescribed by this document.

P2503.4 Building sewer testing. The *building sewer* shall be tested by insertion of a test plug at the point of connection with the public sewer and filling the *building sewer* with water, testing with not less than a 10-foot (3,048 mm) head of water and be able to maintain such pressure for 15 minutes.

entire sanitary drainage system of an existing building is replaced, existing building drains under concrete slabs and existing building sewers that will serve the new system shall be internally examined to verify that the piping is sloping in the correct direction, is not broken, is not obstructed, and is sized for the drainage load of the new plumbing drainage system to be installed.

P2503.4 Building Sewer Testing. The building sewer shall be tested by insertion of a test plug at the point of connection with the public sewer, ~~and~~ filling the building sewer with water~~, testing with,~~ and pressurizing the sewer to not less than ~~a~~ 10-foot (3,048-mm) head of water. ~~and be able to maintain such~~ The test pressure shall not decrease during a period of not less than ~~for~~ 15 minutes. The building sewer shall be watertight at all points.

A forced sewer test shall consist of pressurizing the piping to a pressure of not less than 5 psi (34.5 kPa) greater than the pump rating and maintaining such pressure for not less than 15 minutes. The forced sewer shall be watertight at all points.



Existing building drains and building sewers require internal examination to verify slope and condition when the entire above-ground sanitary drainage system is replaced.

Analysis: *Clarification* – New text clarifies the method for examining existing building sewers and building drains when the entire sanitary drainage system is replaced. Internal examination is required to verify the size, slope, and condition of the existing piping. A new provision prescribes a pressure test for a forced sewer at a test pressure of 5 psi (34.5 kPa) greater than the pump rating.

CHANGE SIGNIFICANCE: On occasion, an entire plumbing system is replaced except for the below-grade or under-slab sanitary drainage. For example, when a house is substantially damaged by fire, the building may be rebuilt on the existing foundation. In most cases, there is no need to tear out good, serviceable building drains and building sewers for the sake of replacing them with new material. In previous editions of the code, existing sewers and drains required "examination and/or tests" to verify conformance to the code. The language was considered vague and not appropriate for code requirements. The code is now more specific in requiring an internal examination of existing building sewers and building drains when the rest of the sanitary drainage system is replaced. Internal examination is typically accomplished with a videoscope camera without removing or damaging existing piping. The revised provisions specifically state the objective of the internal examination—to verify that the piping is not broken or obstructed, has the proper slope for efficient drainage, and is adequately sized to serve the new sanitary drainage system. Editorial changes to the first paragraph in Section P2503.4 clarify that the building sewer must be watertight at all points during testing. Although there were proposals to eliminate the 10-foot head pressure and simply test gravity sewers by filling the piping with water, the prevailing consensus was to maintain the existing requirement. The code maintains the 10-foot head pressure test with no drop in pressure for 15 minutes. A new second paragraph to this section provides criteria for pressure testing of forced sewers. When it is not possible to drain by gravity, a pump is used to force sanitary waste through the piping. The code prescribes pressure testing the piping of forced sewers at a pressure that is 5 psi greater than the pump capacity.

Justification: Approved through the ANSI process at the national code development hearings.

P2503.5 DWV systems testing. Rough and finished plumbing installations shall be tested in accordance with Sections P2503.5.1 and P2503.5.2.

P2503.5.1 Rough plumbing. DWV systems shall be tested on completion of the rough piping installation by water or for piping systems other than plastic, by air with no evidence of leakage. Either test shall be applied to the drainage system in its entirety or in sections after rough piping has been installed, as follows:

1. **Water test.** Each section shall be filled with water to a point not less than 10 feet (3048 mm) above the highest fitting connection in that section, or to the highest point in the completed system. Water shall be held in the section under test for a period of 15 minutes. The system shall prove leak free by visual inspection.
2. **Air test.** The portion under test shall be maintained at a gauge pressure of 5 pounds per square inch (psi) (34 kPa) or 10 inches of mercury column (34 kPa). This pressure shall be held without introduction of additional air for a period of 15 minutes.

P2503.5 Drain, waste and vent systems testing. Rough-in and finished plumbing installations of drain, waste and vent systems shall be tested in accordance with Sections P2503.5.1 and P2503.5.2.

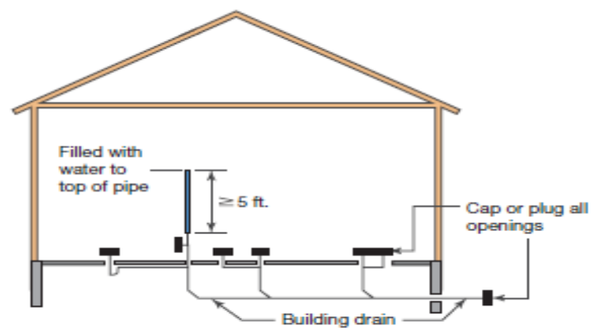
P2503.5.1 Rough plumbing. DWV systems shall be tested on completion of the rough piping installation by water or, for piping systems other than plastic, by air, without evidence of leakage. Either test shall be applied to the drainage system in its entirety or in sections after rough-in piping has been installed, as follows:

1. **Water test.** Each section shall be filled with water to a point not less than 5 feet (1524 mm) above the highest fitting connection in that section, or to the highest point in the completed system. Water shall be held in the section under test for a period of 15 minutes. The system shall prove leak free by visual inspection.
2. **Air test.** The portion under test shall be maintained at a gauge pressure of 5 pounds per square inch (psi) (34 kPa) or 10 inches of mercury column (34 kPa). This pressure shall be held without introduction of additional air for a period of 15 minutes.

P2503.5.2 Finished Plumbing. (*No changes to text.*)

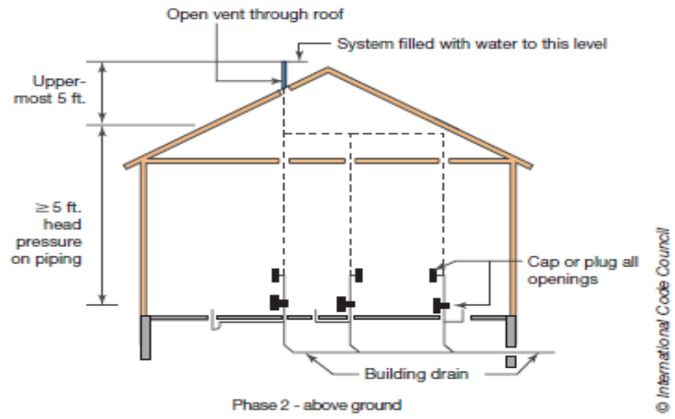
City of Houston Amendment

Analysis: *Modification* – The head pressure for a water test on drain, waste, and vent (DWV) systems has been reduced from 10 feet to 5 feet.



Phase 1 - below slab

CHANGE SIGNIFICANCE: The code has historically required a 10-foot head pressure for testing drain, waste, and vent (DWV) systems with water. The DWV system is filled with water to a point 10 feet higher than the piping being tested and the piping and joints are visually inspected for any leaks that might develop. The duration of the water test is 15 minutes to ensure that the system is watertight. The top 10 feet of the DWV system, which is typically the highest vent through the roof, is only filled with water to the top of the vent terminal. Adding an additional 10-foot standpipe above the vent terminal would not be

	 Water test on DWV system	*easily accomplished and would not provide any benefit because the vent will not carry water and not be under pressure in service.* *The 2015 IRC reduces the water head test height from 10 feet to 5 feet. Although the 10-foot head pressure is a long-standing tradition, proponents of this change stated that the actual head pressure is not nearly as critical as the visual nature of the test. They reasoned that a 10-foot (4.34-psi) head test is unlikely to reveal any leaks or defects that would not be detected by a 5-foot (2.17-psi) head test. Testimony offered that some jurisdictions, including the State of Florida, have previously amended the code in favor of the 5-foot head test. Lowering the fill stack to 5 feet enables both the installer and the inspector to visually observe the water level inside the pipe during testing without the use of a ladder.* **Justification:** Approved through the ANSI process at the national code development hearings.
P2503.5.1 Rough plumbing. DWV systems shall be tested on completion of the rough piping installation by water or for piping systems other than plastic, by air with no evidence of leakage. Either test shall be applied to the drainage system in its entirety or in sections after rough piping has been installed, as follows: **1.** Water test. Each section shall be filled with water to a point not less than 10 feet (3048 mm) above the highest fitting connection in that section, or to the highest point in the completed system. Water shall be held in the section under test for a period of 15 minutes. The system shall prove leak free by visual inspection. **2.** Air test. The portion under test shall be maintained at a gauge pressure of 5 pounds per square inch (psi) (34 kPa) or 10 inches of mercury column (34 kPa). This pressure shall be held without introduction of additional air for a period of 15 minutes.	**P2503.5.1 Rough plumbing.** DWV systems shall be tested on completion of the rough piping installation by water or, for piping systems other than plastic, by air, without evidence of leakage. ~~Either~~ The test shall be applied to the drainage system in its entirety or in sections after rough-in piping has been installed, as follows: **1.** Water test. Each section shall be filled with water to a point not less than 5 feet (1,524 mm) ~~above the highest fitting connection in that section, or to~~ the highest point in the completed system. Water shall be held in the section under test for a period of 15 minutes. The system shall prove leak free by visual inspection. **2.** Air test. The portion under test shall be maintained at a gauge pressure of 5 pounds per square inch (psi) (34 kPa) or 10 inches of mercury column (34 kPa). This pressure shall be held without introduction of additional air for a period of 15 minutes.	***City of Houston Amendment*** **Analysis:** A COH amendment was added to eliminate unnecessary text and to ensure that DWV systems are installed and tested in accordance with minimum city standards and typical plumbing. **Justification:** This amendment is necessary to ensure that DWV systems are installed and tested in accordance with city standards.
2012 Houston IRC – Chapter 26 General Plumbing Requirements	**2015 Houston IRC – Chapter 26 General Plumbing Requirements**	**Code Analysis**
P2603.2.1 Protection Against Physical Damage. In concealed locations, where piping, other than cast-iron or galvanized steel, is installed through holes or notches in studs, joists, rafters, or similar members less than 1½ inches (38 mm) from the nearest edge of the member, the pipe shall be protected by steel shield plates. Such shield plates shall have a thickness of not less than 0.0575 inch (1.463 mm) (No. 16 gage). Such plates shall cover the area of the pipe where the member is notched or bored and shall extend not less than 2 inches (51 mm) above sole plates and below top plates.	**P2603.2.1 Protection Against Physical Damage.** In concealed locations, where piping, other than cast-iron or galvanized steel, is installed through holes or notches in studs, joists, rafters, or similar members less than ~~1½~~ 1¼ inches (~~38~~ 31.8 mm) from the nearest edge of the member, the pipe shall be protected by steel shield plates. Such shield plates shall have a thickness of not less than 0.0575 inch (1.463 mm) (No. 16 gage). Such plates shall cover the area of the pipe where the member is notched or bored and shall extend not less than 2 inches (51 mm) above sole plates and below top plates.	***City of Houston Amendment*** **Analysis:** ***Modification*** – For piping installed through bored holes or in notches, the minimum clearance distance from the concealed piping to the edge of the framing member has been reduced from 1½-inches to 1¼-inches. Protection is required for piping installed less than 1¼-inches from the edge of the framing member. *CHANGE SIGNIFICANCE: Plumbing piping other than cast iron or galvanized steel installed through holes in framing members is subject to punctures from fasteners of sheathing or finish materials unless the piping is placed a sufficient distance away from the face of the member or protection is provided with steel shield plates applied to the face of the framing member. Similar rules exist for gas piping, hydronic heating and cooling piping, gas vents, clothes dryer ducts, and electrical wiring subject to damage from fasteners. Previously, 1½-inches were considered the safe distance between plumbing piping and the face of a stud, joist, or rafter. Piping installed through holes or notches and less than 1½-inches from the edge of the member required protection by steel shield plates. This provision effectively required shield plates for all copper and plastic plumbing piping installed through holes in 2 x 4 plates and studs in conventional wall construction. The actual dimensions of a nominal 2 x 4 are 1½-inches by 3½-inches. Even a ½-inch-diameter (5/8-inch-O.D.) pipe centered in a 2 x 4 stud wall is slightly less than 1½-inches from both edges of the stud or plate and would require a shield plate installed on both sides of the framing member before the application of drywall or sheathing. To permit the installation of ½-inch and ¾-inch*

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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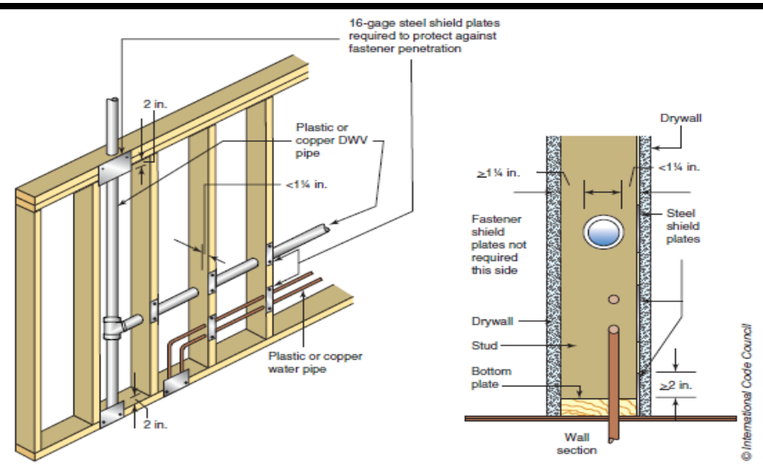
<td> 

Physical protection of concealed piping</td>
<td>piping in a 2 x 4 frame wall without steel plate protection, the minimum clearance distance has been reduced to 1¼-inches. This distance is consistent with NFPA 70 National Electrical Code (NEC) provisions for the installation of the Type NM nonmetallic cable that is common in residential construction.
Justification: Approved through the ANSI process at the national code development hearings.</td>
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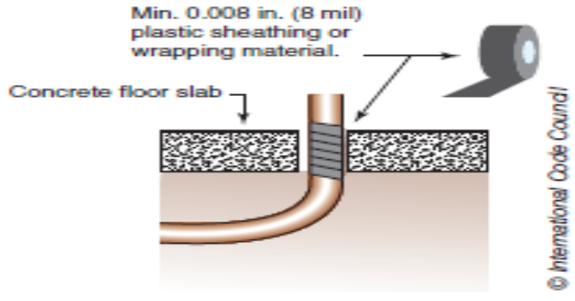
<td>P2603.3 Breakage and Corrosion. Pipes passing through concrete or cinder walls and floors, cold-formed steel framing or other corrosive material shall be protected against external corrosion by a protective sheathing or wrapping or other means that will withstand any reaction from lime and acid of concrete, cinder, or other corrosive material. Sheathing or wrapping shall allow for movement including expansion and contraction of piping. The wall thickness of material shall be not less than 0.025 inch (0.64 mm).</td>
<td>~~P2603.3 Breakage and Corrosion.~~ ~~Pipes passing through concrete or cinder walls and floors, cold-formed steel framing or other corrosive material shall be protected against external corrosion by a protective sheathing or wrapping or other means that will withstand any reaction from lime and acid of concrete, cinder, or other corrosive material. Sheathing or wrapping shall allow for movement including expansion and contraction of piping. The wall thickness of material shall be not less than 0.025 inch (0.64 mm).~~

P2603.3 Protection Against Corrosion. Metallic piping, except for cast iron, ductile iron, and galvanized steel, shall not be placed in direct contact with steel framing members, concrete or masonry. Metallic piping shall not be placed in direct contact with corrosive soil. Where sheathing is used to prevent direct contact, the sheathing material thickness shall be not less than 0.008 inch (8 mil) (0.203 mm) and shall be made of plastic. Where sheathing protects piping that penetrates concrete or masonry walls or floors, the sheathing shall be installed in a manner that allows movement of the piping within the sheathing.

Copper and copper alloy pipe and tubing require protection from corrosion when in contact with concrete, masonry, and steel framing.</td>
<td>City of Houston Amendment
Analysis: Modification – The minimum thickness of sheathing material for protection of piping against corrosion has been reduced from 0.025 inches to 0.008 inches (8 mil). The corrosion protection requirement applies to metallic piping other than cast iron, ductile iron, and galvanized steel that is in direct contact with concrete, masonry, or steel framing. Previously, protection was only required for materials passing through walls and floors of these materials. All metallic piping requires corrosion protection when located in corrosive soils.
CHANGE SIGNIFICANCE: The intent of Section P2603.3 is to protect metallic piping from exterior corrosion caused by contact with corrosive materials. Previously, the code required that sheathing or wrapping material used to protect the piping be at least 0.025 inches thick. The proponent of this change submitted that material of this thickness is not commonly stocked by supply houses and is not being installed or required in the field. Much thinner plastic sheathing materials have been used across the country for decades without any reported adverse effects. Cast iron and ductile iron manufacturers recommend for corrosive soil conditions the use of either 0.008-inch-thick low-density polyethylene sheathing or 0.004-inch-thick high-strength cross-laminated polyethylene sheathing. For small metallic pipes such as copper tubing (½ to 1¼ inches) passing through concrete or masonry, plumbing supply houses normally stock 0.004- and 0.006-inch-thick low-density “flat tube” plastic sheathing materials, and that is what is being used in the field. To conform to the most stringent of the recommendations for sheathing materials, the code now prescribes a minimum thickness of 0.008-inch (8-mil) material. The new wording may also change the scope somewhat by requiring corrosion protection for the applicable types of metallic piping (typically copper piping and tubing) that come in contact with concrete, masonry, and steel framing. Previously the code regulated only piping passing through walls and floors of these materials. Concern was expressed that this language may suggest that some types of metallic piping and tubing may require wrap protection when fastened to the surface of a concrete or masonry foundation wall. Although corrosion protection is not a concern for cast iron, ductile iron, and galvanized steel in contact with masonry, concrete, and steel framing, all metallic piping must be protected from corrosive soils.
This change to the code also intends to clarify the intent for allowing movement of piping that has been wrapped. The previous language “Sheathing or wrapping shall allow for movement including expansion and contraction of piping” was not clear to many code users. Consensus indicates that sheathing or wrapping that protects a pipe passing through concrete or masonry, such as a pipe below a slab coming up through and cast in the slab, should allow for some “give” between the pipe and the concrete or masonry. The new text clarifies the meaning by stating that sheathing shall be installed in a manner that allows movement of the piping within the sheathing for pipes that pass-through concrete or masonry.</td>
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2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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TABLE P2605.1
PIPING SUPPORT

PIPING MATERIAL	MAXIMUM HORIZONTAL SPACING (feet)	MAXIMUM VERTICAL SPACING
ABS pipe	4	10[b]
Aluminum tubing	10	15
Brass pipe	10	10
Cast-iron pipe	5[a]	15
Copper or copper alloy pipe	12	10
Copper or copper alloy tubing (1¼ inches in diameter and smaller)	6	10
Copper or copper alloy tubing (1½ inches in diameter and larger)	10	10
Cross-linked polyethylene (PEX) pipe	2.67 (32 inches)	10[b]
Cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX) pipe	2.67 (32 inches)	4[b]
CPVC pipe or tubing (1 inch in diameter and smaller)	3	10[b]
CPVC pipe or tubing (1¼ inches in diameter and larger)	4	10[b]
Lead pipe	Continuous	4
PB pipe or tubing	2.67 (32 inches)	4
Polyethylene/aluminum/polyethylene (PE-AL-PE) pipe	2.67 (32 inches)	4[b]
Polyethylene of raised temperature (PE-RT) pipe	2.67 (32 inches)	10[b]
Polypropylene (PP) pipe or tubing (1 inch and smaller)	2.67 (32 inches)	10[b]
Polypropylene (PP) pipe or tubing (1¼ inches and larger)	4	10[b]

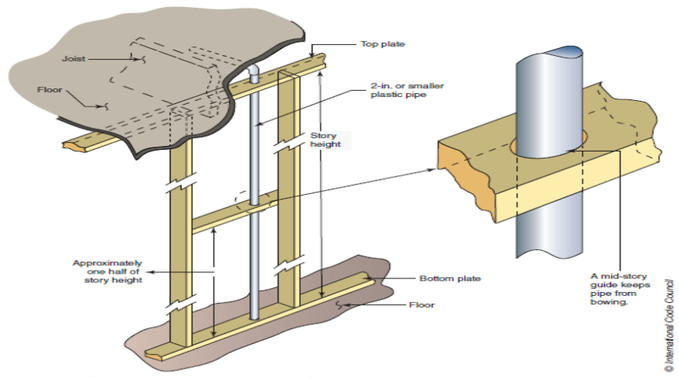
TABLE P2605.1 Piping Support

Piping Material	Maximum Horizontal Spacing (feet)	Maximum Vertical Spacing (feet)
~~Brass Pipe~~	~~10~~	~~10~~
Cross-linked polyethylene (PEX) pipe, 1 inch and smaller	2.67 (32 inches)	10[b]
Cross-linked polyethylene (PEX) pipe, 1¼ inch and larger	4	10[b]
Polyethylene of Raised Temperature (PE-RT) pipe, 1 inch and smaller	2.67 (32 inches)	10[b]
Polyethylene of Raised Temperature (PE-RT) pipe, 1¼ inch and larger	4	10[b]

(Portions of table not shown remain unchanged.)

a. *(No change to text.)*

b. ~~Mid-story guide~~ For sizes 2 inches and smaller, a guide shall be installed midway between required vertical supports. Such guides shall prevent pipe movement in a direction perpendicular to the axis of the pipe.



A guide is required at the midpoint between supports for vertical plastic piping 2 inches and smaller.

City of Houston Amendment

Analysis: ***Modification –*** *Support spacing requirements for PEX and PE-RT tubing 1¼-inches and greater in diameter have been added to the table. Footnote b of Table P2605.1 clarifies the mid-story guide requirements for some types of vertical pipe 2 inches and smaller in diameter.*

CHANGE SIGNIFICANCE: Cross-linked polyethylene (PEX) and polyethylene of raised temperature (PE-RT) tubing is being made in larger diameters that are stiffer and require less support. Table P2605.1 now includes support spacing for these materials in pipe sizes 1¼ inches and larger. Horizontal spacing for the larger-diameter piping is 4 feet compared to 2.67 feet for piping 1 inch or less in diameter.

Mid-story guides are required for vertical smaller-diameter flexible piping to restrict the movement of the pipe. When installed vertically, the various types of plastic piping can bow out of line. This side-to-side movement, either parallel or perpendicular to the plane of the wall, typically occurs when the pipe is filled with water (water distribution piping) or is subjected to hot water flow (drainage piping). The bowed piping can come in contact with adjacent piping, fittings, or other objects (such as wall coverings) that might cause noise or damage to the piping. If the piping was allowed to bow unrestricted, high bending stresses could occur at the required vertical pipe supports. As a guide allows movement of the pipe in a direction parallel to the pipe axis, the guide is not required to firmly grip the pipe or absolutely prevent any movement whatsoever. For example, in wood frame construction, a mid-story pipe guide could be a horizontal block of wood (between studs) that has a clearance hole for the pipe to pass through. The revision to footnote b better defines mid-story guides and clarifies their purpose to restrain vertical piping from moving sideways at the midpoint between required vertical supports. The guides are required for all types of plastic piping (i.e., PEX, PEX-AL-PEX, PE-RT, ABS, CPVC, PVC, and PP) 2 inches and smaller in diameter. Brass and bronze are copper alloys and are covered under the copper and copper alloys listed in Table P2605.1. Therefore, brass pipe has been deleted from the table.

Justification: Approved through the ANSI process at the national code development hearings.

2012 Houston IRC – Chapter 27 Plumbing Fixtures	2015 Houston IRC – Chapter 27 Plumbing Fixtures	Code Analysis

P2702.1 Plumbing fixtures. Plumbing fixtures, other than water closets, shall be provided with *approved* strainers.

Exception: Hub drains and standpipes.

P2706.1 General. Waste receptors shall be of an *approved* type. Plumbing fixtures or other receptors receiving the discharge of indirect waste pipes shall be shaped and have a capacity to prevent splashing or flooding and shall be readily accessible for inspection and cleaning. Waste receptors and standpipes shall be trapped and vented and shall connect to the building drainage system. A removable strainer or basket shall cover the waste outlet of waste receptors. Waste receptors shall be installed in ventilated spaces. Waste receptors shall not be installed in bathrooms, attics, crawl spaces, interstitial spaces above ceilings and below floors or in any inaccessible or unventilated space such as a closet. Ready access shall be provided to waste receptors.

Exceptions:

SECTION R202
DEFINITIONS

WASTE RECEPTOR. A floor sink, standpipe, hub drain, or a floor drain that receives the discharge of one or more indirect waste pipes.

P2702.1 Plumbing Fixtures. Plumbing fixtures, other than water closets, shall be provided with approved strainers.

Exception: Hub drains receiving only clear water waste and standpipes shall not require strainers.

P2706.1 General. ~~Waste receptors shall be of an approved type. Plumbing fixtures or other receptors receiving the discharge of indirect waste pipes shall be shaped and have a capacity to prevent splashing or flooding and shall be readily accessible for inspection and cleaning. Waste receptors and standpipes shall be trapped and vented and shall connect to the building drainage system.~~ For other than hub drains that receive only clear-water waste and standpipes,

City of Houston Amendment

Analysis: ***Modification –*** *A definition of waste receptor has been added to the code. Waste receptors are now permitted in bathrooms and closets.*

CHANGE SIGNIFICANCE: A definition for "waste receptor" has been added to Chapter 2 to clarify the meaning and give clear direction to the code user. The definition includes only four items—a floor sink, standpipe, hub drain, or a floor drain that receives the discharge of one or more indirect waste pipes. Because they are clearly defined, waste receptors do not require approval by the building official. Floor sinks and floor drains are required to comply with standards. Standpipes and hub drains have specific code requirements. Any other receptor that the designer or installer wants to use will have to be approved under Section R104.11 for alternate materials, methods, and equipment.

As defined in Section P2706.1.1, a hub drain is simply a pipe hub or a pipe that extends at least 1 inch above a water-impervious floor, such as concrete. Hub drains that receive only clear water waste and standpipes do not require strainers. There is a low probability that solids will enter these receptors and strainers are not needed. The prohibition against locating waste receptors in bathrooms or closets was deleted. This change recognizes that floor drains, floor sinks or hub drains may be in closets or bathrooms to receive the condensate from air-conditioning units or the discharge from water heater pan drains or

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1. Open hub waste receptors shall be permitted in the form of a hub or pipe extending not less than 1 inch (25 mm) above a water-impervious floor and are not required to have a strainer. **2.** Clothes washer standpipes shall not be prohibited in bathrooms. **P2706.2 Standpipes.** Standpipes shall extend not less than of 18 inches (457 mm) but not greater than 42 inches (1067 mm) above the trap weir. Access shall be provided to standpipe traps and drains for rodding. **P2706.2.1 Laundry tray connection.** A laundry tray waste line is permitted to connect into a standpipe for the automatic clothes washer drain. The standpipe shall extend not less than 30 inches (762 mm) above the trap weir and shall extend above the flood level rim of the laundry tray. The outlet of the laundry tray shall not be greater than 30 inches (762 mm) horizontal distance from the standpipe trap.	~~A~~a removable strainer or basket shall cover the waste outlet of waste receptors. Waste receptors shall not be installed in ~~ventilated~~ concealed spaces. Waste receptors shall not be installed in bathrooms plenums, attics, crawl spaces, or interstitial spaces above ceilings and below floors. ~~or in any inaccessible or unventilated space such as a closet. Ready access shall be provided to w~~Waste receptors shall be readily accessible. ~~**Exceptions:**~~ ~~**1.** Open hub waste receptors shall be permitted in the form of a hub or pipe extending not less than 1 inch (25 mm) above a water-impervious floor and are not required to have a strainer.~~ ~~**2.** Clothes washer standpipes shall not be prohibited in bathrooms.~~ **P2706.1.1 Hub Drains.** Hub drains shall be in the form of a hub or a pipe that extends not less than 1 inch (25mm) above a water-impervious floor. **P2706.1.2 Standpipes.** Standpipes shall extend not less than ~~of~~ 18 inches (457 mm) and ~~but~~ not greater than 42 inches (1067 mm) above the trap weir. ~~Access shall be provided to standpipe traps and drains for rodding.~~ **P2706.1.2.1 Laundry Tray Connection to Standpipe.** Where ~~A~~ a laundry tray waste line is permitted to connects into a standpipe for ~~the~~ an automatic clothes washer drain. ~~, T~~the standpipe shall extend not less than 30 inches (762 mm) above the standpipe trap weir and shall extend above the flood level rim of the laundry tray. The outlet of the laundry tray shall not be greater than 30 inches (762 mm) horizontally ~~distance~~ from the standpipe trap.	*temperature and pressure (T&P) relief valves. Standpipes have specifically been permitted in bathrooms beginning with the 2012 IRC.* *The first three sentences of Section P2706.1 have been deleted because they are redundant. Section P2601.2 already covers where waste receptors must be connected, and Section P3201.6 covers the requirement for traps for each fixture. Reference to inaccessible spaces was deleted because all waste receptors must be readily accessible. The term "readily accessible" as defined in Chapter 2 means that access can be gained without the removal of a panel or obstruction. The reference to an unventilated space was unclear and has been deleted.* **Justification:** Approved through the ANSI process at the national code development hearings.  Typical laundry standpipe is an example of a waste receptor.
P2708.1 General. Shower compartments shall have not less than 1,024 square inches (0.827 m^2) ~~900 square inches (0.6 m^2)~~ of interior cross-sectional area. Shower compartments shall be not less than 30 inches (762 mm) in minimum dimension measured from the finished interior dimension of the shower compartment, exclusive of fixture valves, shower heads, soap dishes, and safety grab bars or rails. The minimum required area and dimension shall be measured from the finished interior dimension at a height equal to the top of the threshold and at a point tangent to its centerline and shall be continued to a height of not less than 70 inches (1778 mm) above the shower drain outlet. Hinged shower doors shall open outward. The wall area above built-in tubs having installed shower heads and in shower compartments shall be constructed in accordance with Section R702.4. Such walls shall form a water-tight joint with each other and with either the tub, receptor, or shower floor. **Exceptions:** **1.** Fold-down seats shall be permitted in the shower, provided the required 1,024 square inches (0.827 m^2) ~~900 square inches (0.6 m^2)~~ dimension is maintained when the seat is in the folded-up position. **2.** When replacing standard size bathtubs of 30 inches by 60 inches, shower compartments having not less than 25 inches (635 mm) in minimum dimension measured from the finished interior dimension of the compartment provided that the shower compartment has a cross-sectional area of not less than 1,300 square inches (0.838 m^2).	**P2708.1 General.** Shower compartments shall have not less than 1,024 square inches (0.827 m^2) ~~900 square inches (0.6 m^2)~~ of interior cross-sectional area. Shower compartments shall be not less than 30 inches (762 mm) in minimum dimension measured from the finished interior dimension of the shower compartment, exclusive of fixture valves, shower heads, soap dishes, and safety grab bars or rails. The minimum required area and dimension shall be measured from the finished interior dimension at a height equal to the top of the threshold and at a point tangent to its centerline and shall be continued to a height of not less than 70 inches (1,778 mm) above the shower drain outlet. Hinged shower doors shall open outward. The wall area above built-in tubs having installed shower heads and in shower compartments shall be constructed in accordance with Section R702.4. Such walls shall form a water-tight joint with each other and with either the tub, receptor, or shower floor. **Exceptions:** **1.** Fold-down seats shall be permitted in the shower, provided the required 1,024 square inches (0.827 m^2) ~~900 square inch (0.6 m^2)~~ dimension is maintained when the seat is in the folded-up position. **2.** When replacing standard size bathtubs of 30 inches by 60 inches (762 mm by 1,524 mm), shower ~~Shower~~ compartments having not less than 25 inches (635 mm) in minimum dimension measured from the finished interior dimension of the compartment provided that the shower compartment has a cross-sectional area of not less than 1,300 square inches (0.838 m^2).	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.

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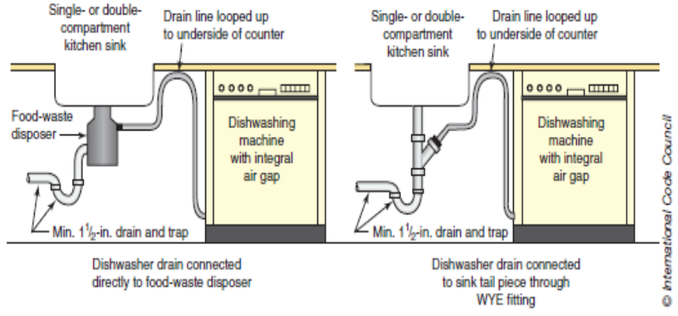
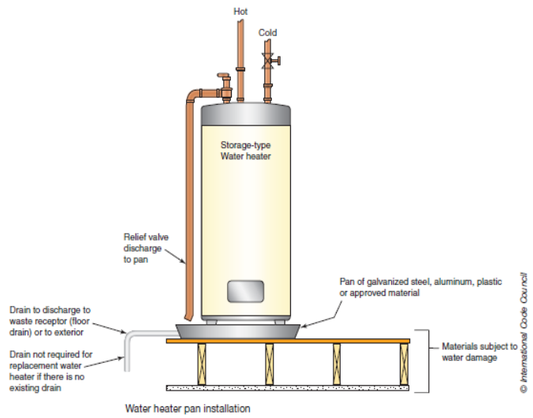
N/A	**P2708.2 Shower *drain*.** Shower drains shall have an outlet size of not less than ~~1 ½ inches [38 mm]~~ 2 inches (50.8 mm) in diameter.	***City of Houston Amendment*** **Analysis:** An amendment was added to correlate with the minimum requirements of the *Houston Plumbing Code*. **Justification:** This amendment ensures that the section correlates to sections 3005.4.1 and 701.6 of the UPC.
P2709.5 Test for shower receptors. Shower receptors shall be tested for watertightness by filling with water to the level of the rough threshold. The test plug shall be so placed that both upper and under sides of the sub-pan shall be subjected to the test at the point where it is clamped to the drain.	**P2709.5 Test for shower receptors.** Shower receptors shall be tested for watertightness by filling with water to the level of the rough threshold. The test plug shall be so placed that both upper and under sides of the sub pan shall be subjected to the test at the point where it is clamped to the drain.	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
P2717.3 Sink, dishwasher and food grinder. The combined discharge from a sink, dishwasher, and waste grinder is permitted to discharge through a single 1½-inch (38 mm) trap. The discharge pipe from the dishwasher shall be increased to not less than ¾ inch (19 mm) in diameter and shall connect ~~with a wye fitting between the discharge of the food-waste grinder and the trap inlet or~~ to the head of the food grinder. The dishwasher waste line shall rise and be securely fastened to the underside of the counter before connecting to the sink tail piece or the food grinder.	**SECTION P2717** **DISHWASHING MACHINES** **P2717.1 Protection of Water Supply.** The water supply ~~for~~ to a dishwasher~~s~~ shall be protected against backflow by an air gap complying with ASME A112.1.3 or A112.1.2 that is installed integrally within the machine or a ~~integral~~ backflow preventer in accordance with Section P2902. **P2717.2 Sink and dishwasher.** The combined discharge from a dishwasher and a one- or two-compartment sink, with or without a food-waste disposer, shall be served by a trap of not less than 1½ inches (38 mm) in outside diameter. The dishwasher discharge pipe or tubing shall rise to the underside of the counter and be fastened or otherwise held in that position before connecting to the head of the food-waste disposer or ~~to a wye fitting in~~ the sink tailpiece. ~~**P2717.3 Sink, Dishwasher and Food Grinder.** The combined discharge from a sink, dishwasher, and waste grinder is permitted to discharge through a single 1 1/2-inch (38 mm) trap. The discharge pipe from the dishwasher shall be increased to not less than 3/4 inch (19 mm) in diameter and shall connect with a wye fitting between the discharge of the food-waste grinder and the trap inlet or to the head of the food grinder. The dishwasher waste line shall rise and be securely fastened to the underside of the counter before connecting to the sink tail piece or the food grinder.~~  Dishwasher drain	***City of Houston Amendment*** **Analysis:** This amendment has been renumbered and relocated. No changes to the code requirements or code intent. *CHANGE SIGNIFICANCE: Revised Section P2717 adds references to applicable standards for the integral backflow protection of the potable water supply serving dishwashing machines. The requirement for dishwashing machines to comply with ASSE 1006 (covering the requirement for an internal air gap on the water supply) was removed from the 2012 code because the standard was withdrawn by ASSE, and the machine manufacturers were no longer indicating compliance with that standard. To provide inspectors with a means to verify that dishwashers have integral backflow protection, the 2015 IRC requires compliance to ASME A112.1.3 or A112.1.2. The standards identify methods of providing protection against back-siphonage through means of an air gap and establish physical requirements and methods of testing air gaps. The inspector is now able to identify those standard numbers on either the machine or in the literature for the machine to verify compliance with the code.* *The text regarding connection of the dishwasher discharge to either the kitchen sink tailpiece or the food waste disposer has been consolidated into one section, with mostly editorial revisions to clarify the requirements. The provision allowing the sink, dishwasher, and food waste disposer (if one is provided) to drain through a single 1½-inch trap has been retained. The kitchen sink is more precisely defined as a one- or two-compartment sink, as the code has always intended, to ensure there is no misunderstanding that the provision might be limited to a single-compartment sink. The text setting the size of the dishwasher discharge line has been removed because machines are manufactured with different discharge diameters and configurations, and the applicable standards do not provide clear guidance on the discharge connection to the sink tailpiece or food waste disposer.* *For some time, the code has required the dishwasher discharge hose to loop up high in the under-counter space before connecting to the sink tailpiece or disposer. This configuration prevents the discharge contents, sink backup, and contaminants from flowing back to the dishwashing machine. The language in the 2012 edition of the IRC required a secure connection to the underside of the counter for this discharge loop. Following this requirement to the letter is not always easily accomplished or even feasible. The underside of the counter is oftentimes difficult to reach through small spaces around the kitchen sink, and counters made of granite and similar materials are not suitable for fastening to. The new language simply requires the loop to be held in position and serves the intent of the code without requiring fastening.* **Justification:** The amendment was renumbered and relocated from section P2717.3 IRC 2012.
N/A	**SECTION P2725** ~~**NONLIQUID SATURATED TREATMENT SYSTEMS**~~ **RESERVED**	***City of Houston Amendment*** **Analysis:** A COH amendment was added eliminating these new model code provisions to comply with local requirements.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
COLOR CODE INDEX: **Turquoise** = NEW or Modified Text by ICC in 2015 ~~**Yellow Strike through**~~ = Text Deleted from the Code by COH	**Text Underlined** = COH Amendment added (NEW) **Green Text** = NEW or Modified Text by COH in 2015	**Grey Text** = Previous COH Amendment Brought Forward to 2015 ~~**Strike through**~~ = Text Deleted from the Code by ICC
	{**EDITORIAL NOTE:** DELETE AND RESERVE THE CONTENTS OF THIS SECTION.} ~~**P2725.1 General.** Materials, design, construction, and performance of nonliquid saturated treatment systems shall comply with NSF 41.~~	**Justification:** Nonliquid saturated treatment systems are not authorized for use within the City of Houston.
2012 Houston IRC – Chapter 28 Water Heaters	**2015 Houston IRC – Chapter 28 Water Heaters**	**Code Analysis**
P2801.1 Required. Each dwelling shall have an approved automatic water heater or other type of domestic water-heating system sufficient to supply hot water to plumbing fixtures and appliances intended for bathing, washing or culinary purposes. Storage tanks shall be constructed of noncorrosive metal or shall be lined with noncorrosive material.	**P2801.1 Required.** ~~Each dwelling shall have an approved automatic water heater or other type of domestic water-heating system sufficient to supply h~~Hot water shall be supplied to plumbing fixtures and plumbing appliances intended for bathing, washing or culinary purposes. ~~Storage tanks shall be constructed of noncorrosive metal or shall be lined with noncorrosive material.~~	***City of Houston Amendment*** **Analysis:** ***Modification –*** *The code now specifically requires drain valves with a threaded outlet for water heaters. The water heater pan requirements have been expanded to accept aluminum and plastic pans of the prescribed thickness. The code clarifies that a pan drain is not required when a water heater is replaced and there is no existing drain.* The model code was expanded to include addition code clarification and guidance. A COH was amendment added to provide additional clarity and to identify that listed pans shall be used where they are available. Where allowed, new code text addresses minimum requirements for the use of plastic pans. *The model code was modified to include additional clarity. A COH amendment was added to address local requirements for installations.* *CHANGE SIGNIFICANCE: Previous editions of the code did not specifically require drain valves on water heaters, although manufacturers do provide such drains on storage-tank-type water heaters. The International Plumbing Code (IPC) has required a drain valve at the bottom of each tank-type water heater and hot water storage tank but stated that the drain valve had to comply with a referenced standard. The standard has been discontinued and has been removed from the 2015 IPC. Both codes now prescribe drain valves with inlets of not less than ¾-inch nominal iron pipe size and outlets provided with male hose threads to connect a garden hose. Water heater drain valves are necessary to drain water heaters for replacement or maintenance.* *Safety pans are required under storage-tank-type water heaters if a leak in the tank will cause damage. Previously, the code prescribed 24-gage galvanized steel pans or other pans approved by the building official Aluminum and plastic water heater pans are common in the marketplace and are installed across the United States. The intent of the expanded language is to recognize manufactured products that are widely accepted in the marketplace. In addition, the new text sets appropriate minimum thicknesses for aluminum and plastic pans that are considered sufficiently durable for the use. The provision for listed pans to comply with CSA LC3 has been deleted because there is not any pan produced in the United States that complies with that standard. CSA withdrew the standard in November 2011. A new provision prohibits the use of plastic pans under gas-fired water heaters. Although there was no testimony indicating there had been problems with such installations, there was a concern that radiant heat coming from the bottom of a gas-fired water heater could make a plastic pan more susceptible to puncturing.* *A replacement water heater must be installed to the current code, the same as any new installation. If the water heater is in a location where leakage will cause damage, a safety pan is also required even if the original installation did not require or have a safety pan. It is typically not a problem to install a replacement water heater with a pan, but the obstacles to installing a drain for that pan can be significant. Many times, there is no feasible way to provide for a suitable disposal point for the pan drain. The new language provides an exception for replacement water heaters that waives the pan drain requirements. Consensus was that a pan with no drain is better than no pan at all. If the water heater tank begins to leak and there is a pan present, the occupant may notice water in the pan and realize that it is not a normal condition. This is opposed to a situation where there is not a pan and the leaking water flows to an unobservable location and does so for a long time, creating damage and mold issues. A pan without a drain will provide a contained area that might allow more time for the leak to be detected. An optional water alarm sensor also can be installed in the pan without a drain to alert the occupant to an accumulation of leaking water.*
N/A	**P2801.2 Drain Valves.** Drain valves for emptying shall be installed at the bottom of each tank-type water heater and hot water storage tank. The drain valve inlet shall be not less than ¾-inch nominal iron pipe size and the outlet shall be provided with a male hose thread.	
P2801.5 Required pan. Where a storage tank-type water heater or a hot water storage tank is installed in a location where water leakage from the tank will cause damage, the tank shall be installed in a galvanized steel pan having a material thickness of not less than 0.0236 inch (0.6010 mm) (No. 24 gage), or other pans approved for such use. Listed pans shall comply with CSA LC3.	**P2801.6 Required pan.** Where a ~~storage tank-type~~ water heater or a hot water storage tank is installed in a location where water leakage from the water heater, the hot water storage tank, or the connections thereto will cause damage, the tank shall be installed in a pan constructed of one of the following: **1.** Galvanized steel or aluminum of not less than 0.0236 inch (0.6010 mm) in thickness. **2.** Plastic not less than 0.036 inch (0.9 mm) in thickness. **3.** Other approved materials. Where available, *listed* pans shall be used. A plastic pan shall not be installed beneath a gas-fired water heater.	
P2801.5.1 Pan size and drain. The pan shall be not less than 1 ½-inches (38 mm) deep and shall be of sufficient size and shape to receive all dripping or condensate from the tank or water heater. The pan shall be drained by an indirect waste pipe of not less than ¾-inch (19 mm) diameter. Piping for safety pan drains shall be of those materials listed in Table P2905.5.  Water heater pan installation	**P2801.6.1 Pan size and drain.** The pan shall be not less than 1½ inches (38 mm) deep and shall be of sufficient size and shape to receive dripping or condensate from the tank or water heater. The pan shall be drained by an indirect waste pipe of not less than ¾ inch (19 mm) diameter. Piping for safety pan drains shall be of those materials indicated in Table P2905.5. Where a pan drain was not previously installed, a pan drain shall ~~not~~ be required for a replacement water heater installation and shall be installed in accordance with Section P2801.6.2.  Water heater drain valve with threaded outlet and drain pan	**Justification:** Approved through the ANSI process at the national code development hearings.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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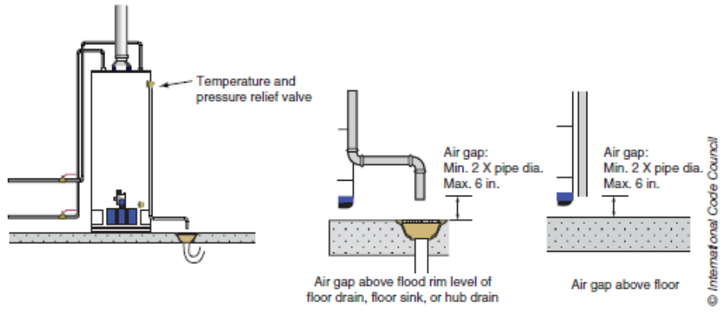
P2803.6.1 Requirements for discharge pipe. The discharge piping serving a pressure-relief valve, temperature relief valve or combination valve shall:

1. Not be directly connected to the drainage system.
2. Discharge through an air gap located in the same room as the water heater.
3. Not be smaller than the diameter of the outlet of the valve served and shall discharge full size to the air gap.
4. Serve a single relief device and shall not connect to piping serving any other relief device or equipment.
5. Discharge to the floor, ~~to the pan serving the water heater or storage tank,~~ to a waste receptor or to the outdoors.
6. Discharge in a manner that does not cause personal injury or structural damage.
7. Discharge to a termination point that is readily observable by the building occupants.
8. Not be trapped.
9. Be installed to flow by gravity.
10. Not terminate more than 6 inches (152 mm) above the floor or waste receptor.
11. Not have a threaded connection at the end of the piping.
12. Not have valves or tee fittings.
13. Be constructed of those materials listed in Section P2905.5 or materials tested, rated, and *approved* for such use in accordance with ASME A112.4.1.

P2804.6.1 Requirements for discharge pipe. The discharge piping serving a pressure-relief valve, temperature relief valve or combination valve shall:

1. Not be directly connected to the drainage system.
2. Discharge through an air gap located in the same room as the water heater.
3. Not be smaller than the diameter of the outlet of the valve served and shall discharge full size to the air gap.
4. Serve a single relief device and shall not connect to piping serving any other relief device or equipment.
5. Discharge to the floor, ~~to the pan serving the water heater or storage tank,~~ to a waste receptor or to the outdoors.
6. Discharge in a manner that does not cause personal injury or structural damage.
7. Discharge to a termination point that is readily observable by the building occupants.
8. Not be trapped.
9. Be installed to flow by gravity.
10. Terminate not more than 6 inches (152 mm) and not less than two times the discharge pipe diameter above the floor or waste receptor flood level rim.
11. Not have a threaded connection at the end of the piping.
12. Not have valves or tee fittings.
13. Be constructed of those materials indicated in Section P2906.5 or materials tested, rated, and *approved* for such use in accordance with ASME A112.4.1.
14. ~~Be one nominal size larger than the size of the relief valve outlet, where the relief valve discharge piping is constructed of PEX or PE-RT tubing. The outlet end of such tubing shall be fastened in place.~~



Air gap for temperature and pressure (T&P) relief valve discharge pipe

City of Houston Amendment

Analysis: The model code was relocated from IRC P2803.6.1 to IRC 2015 Section P2804.6.1 and was expanded to include additional details in Item #10 and includes the addition of one item on the list of requirements (#14). The previous COH amendment was retained and expanded to delete the newly added requirement #14. No changes to the code requirements or code intent. The temperature and pressure (T&P) relief valve discharge pipe termination must have an air gap suitable to protect the potable water supply distribution system of the building. PEX and PE-RT tubing used for relief valve discharge piping must be one size larger than the T&P valve discharge outlet, and the outlet end of the tubing must be fastened in place.

CHANGE SIGNIFICANCE: The outlet of a temperature and pressure (T&P) relief valve is considered a potable water outlet that must be protected against backflow conditions. Item 2 of Section P2804.6.1 has always required the T&P piping to discharge through an air gap in the same room as the water heater, but the code has not specifically addressed the minimum dimension for the air gap in the water heater section. The revised text in Item 10 in the list of requirements now prescribes a minimum air gap of two times the discharge pipe diameter to provide the appropriate backflow protection.

Item 13 of Section P2804.6.1 requires the discharge piping serving the relief valve to be constructed of materials listed in Section P2906.5 and Table P2906.5, Water Distribution Pipe, or materials tested, rated, and approved for such use in accordance with ASME A112.4.1. There are many materials approved for use as water distribution pipe, and any of these can be used for the water heater discharge pipe. Cross-linked polyethylene (PEX) plastic tubing and polyethylene of raised temperature (PE-RT) plastic tubing are examples of approved piping. Some in the industry have been concerned that these two materials use fittings that reduce the inside diameter to less than the nominal pipe size. Item 3 of this section requires that the discharge piping must not be smaller than the diameter of the outlet of the water heater T&P relief valve. In most cases, this outlet is ¾-inch nominal pipe size. PEX and PE-RT tubing use insert fittings for connections. The bore size for a ¾-inch male adapter fitting reduces the internal diameter of the pipe, and there is concern that the discharge from a T&P valve could be restricted and be a safety concern. The new language requires that PEX and PE-RT tubing used for relief valve discharge piping be one size larger so that the insert fitting has a larger bore and does not cause a safety concern. For a typical discharge outlet of ¾-inch diameter, 1-inch PEX or PE-RT tubing would be required.

The other concern regarding PEX, and PE-RT tubing is that the material is very flexible and where supplied from a coil, the tubing has a "memory" to return to a coil shape. This flexibility and memory to stay in a coil shape can present installation problems including keeping the discharge end of the tubing in its proper location. Therefore, new language is added to require that the outlet end of the tubing be fastened in place.

Justification: The amendment was renumbered and relocated from section P2803.6.1 IRC 2012.

2012 Houston IRC – Chapter 29 Water Supply and Distribution	2015 Houston IRC – Chapter 29 Water Supply and Distribution	Code Analysis

SECTION P2901
GENERAL

P2901.1 Potable water required. *Dwelling units* shall be supplied with potable water in the amounts and pressures specified in this chapter. Where a nonpotable water-distribution system is installed, the nonpotable system shall be identified by color marking, metal tags or other appropriate method. Where color is used for marking, purple shall be used to identify municipally reclaimed

SECTION R202
DEFINITIONS

RECLAIMED WATER. Nonpotable water that has been derived from the treatment of wastewater by a facility or system licensed or permitted to produce water meeting the jurisdiction's water requirements for its intended uses. Also known as "Recycled Water."

City of Houston Amendment

Analysis: Nonpotable water outlets, such as hose connections, that utilize nonpotable water must be identified with a warning and a symbol that nonpotable water is being used. The color purple is established for identifying distribution piping conveying nonpotable water. New Sections P2910 through P2913 are extracted from the International Green Construction Code (IgCC) and intend to provide guidance on the collection, storage, and distribution of various types of nonpotable water for residential buildings.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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water, rainwater, and graywater distribution systems. Nonpotable outlets that could inadvertently be used for drinking or domestic purposes shall be posted.

P2901.2 – N/A
P2901.2.1 – N/A
P2901.2.2 – N/A
P2901.2.2.1 – N/A
P2901.2.2.2 – N/A
P2901.2.2.3 – N/A

SECTION P2902
PROTECTION OF POTABLE WATER SUPPLY

P2902.1 General. A potable water supply system shall be designed and installed as to prevent contamination from nonpotable liquids, solids or gases being introduced into the potable water supply. Connections shall not be made to a potable water supply in a manner that could contaminate the water supply or provide a cross-connection between the supply and a source of contamination except where approved methods are installed to protect the potable water supply. Cross-connections between an individual water supply and a potable public water supply shall be prohibited.

P2902.2 Plumbing fixtures. The supply lines and fittings for every plumbing fixture shall be installed so as to prevent backflow. Plumbing fixture fittings shall provide backflow protection in accordance with ASME A112.18.1/CSA B125.1.

P2902.3 Backflow protection. A means of protection against backflow shall be provided in accordance with Sections P2902.3.1 through P2902.3.6. Backflow prevention applications shall conform to Table P2902.3, except as specifically stated in Sections P2902.4 through P2902.5.5.

P2902.3.1 Air gaps. Air gaps shall comply with ASME A112.1.2 and air gap fittings shall comply with ASME A112.1.3. The minimum air gap shall be measured vertically from the lowest end of a water supply outlet to the flood level rim of the fixture or receptor into which such potable water outlets discharge. The minimum required air gap shall be twice the diameter of the effective opening of the outlet, but in no case less than the values specified in Table P2902.3.1. An air gap is required at the discharge point of a relief valve or piping. Air gap devices shall be incorporated in dishwashing and clothes washing appliances.

P2902.3.2 Atmospheric-type vacuum breakers. Pipe applied atmospheric-type vacuum breakers shall conform to ASSE 1001 or CSA B64.1.1. Hose-connection vacuum breakers shall conform to ASSE 1011, ASSE 1019, ASSE 1035, ASSE 1052, CSA B64.2, CSA B64.2.1, CSA B64.2.1.1, CSA B64.2.2 or CSA B64.7. These devices shall operate under normal atmospheric pressure when the critical level is installed at the required height.

P2902.3.3 Backflow preventer with intermediate atmospheric vent. Backflow preventers with intermediate atmospheric vents shall conform to ASSE 1012 or CAN/CSA B64.3. These devices shall be permitted to be installed where subject to continuous pressure conditions. The relief opening shall discharge by air gap and shall be prevented from being submerged.

P2902.3.4 Pressure vacuum breaker assemblies. Pressure vacuum breaker assemblies shall conform to ASSE 1020 or CSA B64.1.2. Spill-resistant vacuum breaker assemblies shall comply with ASSE 1056. These assemblies are designed for installation under continuous pressure

ON-SITE NONPOTABLE WATER REUSE SYSTEMS. Water systems for the collection, treatment, storage, distribution, and reuse of nonpotable water generated on-site, including but not limited to gray water systems. This definition does not include rainwater harvesting systems.

P2901.1 Potable Water Required. ~~Dwelling units shall be supplied with potable water in the amounts and pressures specified in this chapter. Where a nonpotable water-distribution system is installed, the nonpotable system shall be identified by color marking, metal tags or other appropriate method. Where color is used for marking, purple shall be used to identify municipally reclaimed water, rainwater, and graywater distribution systems. Nonpotable outlets that could inadvertently be used for drinking or domestic purposes shall be posted.~~ Potable water shall be supplied to plumbing fixtures and plumbing appliances except where treated rainwater, treated gray water or municipal reclaimed water is supplied to water closets, urinals, and trap primers. The requirements of this section shall not be construed to require signage for water closets and urinals.

P2901.2 Identification of Nonpotable Water Systems. Where nonpotable water systems are installed, the piping conveying the nonpotable water shall be identified either by color marking, metal tags or tape in accordance with Sections P2901.2.1 through P2901.2.2.3.

P2901.2.1 Signage Required. Nonpotable water outlets such as hose connections, open-ended pipes and faucets shall be identified with signage that reads as follows: “non-potable water is utilized for [application name]. CAUTION: NON-POTABLE WATER. DO NOT DRINK.” The words shall be legibly and indelibly printed on a tag or sign constructed of corrosion-resistant waterproof material or shall be indelibly printed on the fixture. The letters of the words shall be not less than 0.5 inches (12.7 mm) in height and in colors in contrast to the background on which they are applied. In addition to the required wordage, the pictograph shown in Figure P2901.2.1 shall appear on the required signage.

P2901.2.2 Distribution Pipe Labeling and Marking. Nonpotable distribution piping shall be of purple in color and shall be embossed or integrally stamped or marked with the words: “CAUTION: NONPOTABLE WATER—DO NOT DRINK” or the piping shall be installed with a purple identification tape or wrap. Pipe identification shall include the contents of the piping system and an arrow indicating the direction of flow. Hazardous piping systems shall also contain information addressing the nature of the hazard. Pipe identification shall be repeated at intervals not exceeding 25 feet (7620 mm) and at each point where the piping passes through a wall, floor, or roof. Lettering shall be readily observable within the room or space where the piping is located.

P2901.2.2.1 Color. The color of the pipe identification shall be discernable and consistent throughout the building. The color purple shall be used to identify reclaimed, rain and gray water distribution systems.

P2901.2.2.2 Lettering Size. The size of the background color field and lettering shall comply with Table P2901.2.2.2.

P2901.2.2.3 Identification Tape. Where used, identification tape shall be not less than 3 inches (76.2 mm) wide and have white or black lettering on a purple field stating “CAUTION: NONPOTABLE WATER—DO NOT DRINK.” Identification tape shall be installed on top of nonpotable rainwater

Nonpotable water outlets such as hose connections require warning signs with a pictograph.

CHANGE SIGNIFICANCE: New provisions in the IRC for collecting, storing, and using various types of nonpotable water recognize the growing need for water conservation and the increase in the development of water conservation programs in many regions of the United States. The 2012 IRC introduced gray water recycling systems into the body of the code. Gray water recycling systems conserve water by collecting and using the discharge of lavatories, bathtubs, showers, clothes washers, and laundry trays for flushing water closets and for subsurface landscape irrigation. Water conservation practices create a need to identify various alternate sources of water, and the code now is much broader in its scope of nonpotable water systems. The intent of new Sections P2910 through P2913 is to provide guidance on the collection, storage, identification, and distribution of nonpotable water, including rainwater, reclaimed water, and on-site nonpotable water reuse, for designers or builders who choose to utilize such systems. The provisions are extracted from the International Green Construction Code (IgCC).

Section P2901.2 more precisely describes identification requirements of nonpotable water systems to prevent cross-contamination with potable water and to adequately caution building occupants that the water is nonpotable and has specific limited uses. The 2012 IRC did require reclaimed, rain and gray water piping to be identified with the color purple. However, because there are other alternate sources of water that need identification to protect the safety of the public, the code now includes all types of nonpotable water. The basis for the new language is text from the IgCC and is written to be in alignment with the IgCC requirements. Nonpotable water distribution piping must be purple in color or be labeled in accordance with the code provisions. Nonpotable water outlets, such as hose connections, that utilize nonpotable water must be identified with a pictograph and a warning to not drink the water because it is nonpotable water. Signage is not required for water closets or urinals that are being supplied with a nonpotable water source for flushing purposes.

Gray water recycling systems previously were found in Section 3009 of the sanitary drainage provisions. The provisions for the collection, storage, and distribution of nonpotable water are in Chapter 29 of the 2015 IRC because they are related to the water distribution provisions of this chapter. The exception is subsurface landscape irrigation systems connected to nonpotable water from on-site water reuse systems. Provisions that apply to drain, waste, and vent piping for subsurface landscape irrigation systems are still found in Section P3009, although they also have been revised to reflect current practices and acceptable standards.

There are a couple of notable changes to the gray water recycling provisions that appeared in the 2012 IRC. The use of nonpotable water, including gray water, for flushing water closets and urinals no longer requires introduction of a blue or green food-grade dye to identify the gray water. This was considered an outdated and unnecessary practice that often resulted in staining of fixtures and finishes. Identification of the nonpotable water distribution piping is considered sufficient. On the other hand, gray water used for fixture flushing purposes now requires disinfection and treatment by an on-site water reuse treatment system complying with the NSF 350 standard Onsite Residential and Commercial Water Reuse Treatment Systems. In addition to microbiological contaminants that need disinfection, gray water contains organic compounds, suspended solids, and other contaminants that have the potential to accumulate and negatively impact the functioning of water closets and urinals if not treated properly. The 2012 IRC did not require disinfection or treatment of gray water used for flushing purposes.

Justification: These model code changes are added for public safety.

conditions where the critical level is installed at the required height. Pressure vacuum breaker assemblies shall not be installed in locations where spillage could cause damage to the structure.

P2902.3.5 Reduced pressure principal backflow prevention assemblies. Reduced pressure principal backflow prevention assemblies and reduced pressure principal fire protection backflow prevention assemblies shall conform to ASSE 1013, AWWA C511, CSA B64.4 or CSA B64.4.1. Reduced pressure detector fire protection backflow prevention assemblies shall conform to ASSE 1047. These devices shall be permitted to be installed where subject to continuous pressure conditions. The relief opening shall discharge by air gap and shall be prevented from being submerged.

P2902.3.6 Double check-valve assemblies. Double check-valve assemblies shall conform to ASSE 1015, CSA B64.5, CSA B64.5.1 or AWWA C510. Double-detector check-valve assemblies shall conform to ASSE 1048. These devices shall be capable of operating under continuous pressure conditions.

P2902.4 Protection of potable water outlets. Potable water openings and outlets shall be protected by an air gap, reduced pressure principal backflow preventer with atmospheric vent, atmospheric-type vacuum breaker, pressure-type vacuum breaker or hose connection backflow preventer.

P2902.4.1 Fill valves. Flush tanks shall be equipped with an antisiphon fill valve conforming to ASSE 1002 or CSA B125.3. The fill valve backflow preventer shall be located not less than 1 inch (25 mm) above the full opening of the overflow pipe.

P2902.4.2 Deck-mounted and integral vacuum breakers. Approved deck-mounted or equipment-mounted vacuum breakers and faucets with integral atmospheric vacuum breakers or spill–resistant vacuum breaker assemblies shall be installed in accordance with the manufacturer's instructions and the requirements for labeling. The critical level of the breakers and assemblies shall be located at not less than 1 inch (25 mm) above the flood level rim.

P2902.4.3 Hose connection. Sillcocks, hose bibbs, wall hydrants and other openings with a hose connection shall be protected by an atmospheric-type or pressure-type vacuum breaker or a permanently attached hose connection vacuum breaker.

Exceptions:

1. This section shall not apply to water heater and boiler drain valves that are provided with hose connection threads and that are intended only for tank or vessel draining.
2. This section shall not apply to water supply valves intended for connection of clothes washing machines where backflow prevention is otherwise provided or is integral with the machine.

P2902.5 Protection of potable water connections. Connections to the potable water shall conform to Sections P2902.5.1 through P2902.5.5.

distribution pipes and fastened not greater than every 10 feet (3048 mm) to each pipe length and run continuously the entire length of the pipe.

SECTION P2910
NONPOTABLE WATER SYSTEMS

SECTION P2911
ON-SITE NONPOTABLE WATER REUSE SYSTEMS

P2911.6.1 Gray Water Used for Fixture Flushing. Gray water used for flushing water closets and urinals shall be disinfected and treated by an on-site water reuse treatment system complying with NSF 350.

SECTION P2912
NONPOTABLE RAINWATER COLLECTION AND DISTRIBUTION SYSTEMS

SECTION P2913
RECLAIMED WATER SYSTEMS

TABLE P2901.2.2.2 Size of Pipe Identification

Pipe Diameter (inches)	Length Background Color Field (inches)	Size of Letters (inches)
¾ to 1¼	8	0.5
1½ to 2	8	0.75
2½ to 6	12	1.25
8 to 10	24	2.5
over 10	32	3.5

For SI: 1 inch = 25.4 mm.

(The text of new Sections P2910 through P2913 is too extensive to be included in this publication. Please refer to the 2015 IRC for the complete code text.)

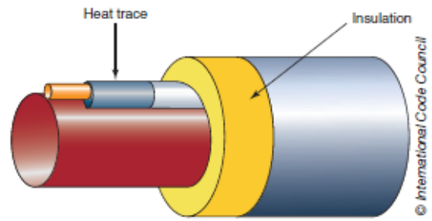
P2902.5.1 Connections to boilers. The potable supply to the boiler shall be equipped with a reduced pressure principal backflow preventer ~~with an intermediate atmospheric vent complying with ASSE 1012 or CSA B64.3. Where conditioning chemicals are introduced into the system, the potable~~

P2902.5.1 Connections to boilers. ~~Where chemicals will not be introduced into a boiler, the~~ The potable water supply to the boiler shall be protected from the boiler by a ~~backflow preventer with an intermediate atmospheric vent complying with ASSE 1012 or CSA B64.3. Where chemicals will be~~

City of Houston Amendment

Analysis: The previous COH amendment is modified for clarity. ***No change to the previous code requirements or code intent.***

~~water connection shall be protected by an air gap or a reduced pressure principal backflow preventer~~ complying with ASSE 1013, CSA B64.4 or AWWA C511.	~~introduced into a boiler, the potable water supply to the boiler shall be protected from the boiler by an air gap or a~~ reduced pressure principal backflow prevention assembly complying with ASSE 1013, CSA B64.4 or AWWA C511.	**Justification:** This amendment is needed to ensure conformity with state and local government policy, including the COH Water Utility Backflow Prevention Policy.
P2902.5.5 Solar systems. The potable water supply to a solar system shall be equipped with a backflow preventer ~~with intermediate atmospheric vent complying with ASSE 1012 or a reduced pressure principal backflow preventer complying with ASSE 1013~~. Where chemicals are used, the potable water supply shall be protected by a reduced pressure principal backflow preventer. **Exception:** Where all solar system piping is a part of the potable water distribution system, in accordance with the requirements of the ~~*International*~~ *Plumbing Code*, and all ping systems are listed for potable water use, cross-connection protection measures shall not be required.	**P2902.5.5 Solar thermal systems.** Where a solar thermal system heats potable water to supply a potable *hot water* distribution or any other type of heating system, the solar thermal system shall be in accordance with Section P2902.5.5.1, P2902.5.5.2 or P2902.5.5.3 as applicable. **P2902.5.5.1 Indirect systems.** Water supplies of any type shall not be connected to the solar heating loop of an indirect solar thermal *hot water* heating system. This requirement shall not prohibit the presence of inlets or outlets on the solar heating loop for the purposes of servicing the fluid in the solar heating loop. **P2902.5.5.2 Direct systems for potable water distribution systems.** Where a solar thermal system directly heats potable water for a potable water distribution system, the pipe, fittings, valves, and other components that are in contact with the potable water in the system shall comply with the requirements of Chapter 29.	***City of Houston Amendment*** **Analysis:** ICC modified the model code provisions extensively for solar thermal systems heating potable water distributions systems. The COH amendment was omitted for model code provisions. **Justification:** This amendment is no longer needed due to appropriate requirements in the model code.
N/A	**P2902.5.5.3 Direct systems for other than potable water distribution systems.** Where a solar thermal system directly heats water for a system other than a potable water distribution system, a potable water supply connected to such system shall be protected by a backflow preventer ~~with an intermediate atmospheric vent complying with ASSE 1012~~. Where a solar thermal system directly heats chemically treated water for a system other than a potable water distribution system, a potable water supply connected to such system shall be protected by a reduced pressure principal backflow prevention assembly complying with ASSE 1013.	***City of Houston Amendment*** **Analysis:** ICC modified the model code provisions extensively for solar thermal systems heating potable water distributions systems. A COH amendment was added to correlate with local policy. **Justification:** This amendment is needed to ensure conformity with state and local government policy, including the COH Water Utility Backflow Prevention Policy.
TABLE P2903.2 **MAXIMUM FLOW RATES AND CONSUMPTION FOR PLUMBING FIXTURES AND FIXTURE FITTINGS [b]** **PLUMBING FIXTURE OR FIXTURE FITTING** / **PLUMBING FIXTURE OR FITTING** Lavatory faucet — 2.2 gpm at 60 psi Shower head [a] — 2.5 gpm at 80 psi Sink faucet — 2.2 gpm at 60 psi Water closet — 1.28 ~~1.6~~ gallons per flushing cycle **For SI:** 1 gallon per minute = 3. 785 L/m, 1 pound per square inch = 6.895 kPa. **a**. A handheld shower spray is also a shower head. **b.** Consumption tolerances shall be determined from referenced standards.	**TABLE P2903.2** **MAXIMUM FLOW RATES AND CONSUMPTION FOR PLUMBING FIXTURES AND FIXTURE FITTINGS [b]** **PLUMBING FIXTURE OR FIXTURE FITTING** / **PLUMBING FIXTURE OR FIXTURE FITTING** Lavatory faucet — 2.2 gpm at 60 psi Shower head [a] — 2.5 gpm at 80 psi Sink faucet — 2.2 gpm at 60 psi Water closet — 1.28 ~~1.6~~ gallons per flushing cycle **For SI:** 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa. **a.** A handheld shower spray ~~shall be considered~~ is also a shower head. **b.** Consumption tolerances shall be determined from referenced standards.	***City of Houston Amendment*** **Analysis:** The previous COH amendment is retained to correlate with state law associated with Texas water conservation requirements. Minor COH amendment included in footnote “a” for clarity. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
P2904.1 General. The design and installation of residential fire sprinkler systems shall be in accordance with NFPA 13D or Section P2904, which shall be considered equivalent to NFPA 13D. Partial residential sprinkler systems shall be permitted to be installed only in buildings not required to be equipped with a residential sprinkler system. Section P2904 shall apply to stand-alone and multipurpose wet-pipe sprinkler systems that do not include the use of	**P2904.1 General.** The design and installation of residential fire sprinkler systems shall be in accordance with NFPA 13D or Section P2904, which shall be considered equivalent to NFPA 13D. Partial residential sprinkler systems shall be permitted to be installed only in buildings not required to be equipped with a residential sprinkler system. Section P2904 shall apply to stand-alone and multipurpose wet-pipe sprinkler systems that do not include the use of	***City of Houston Amendment*** **Analysis:** No changes were made to the model code or the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.

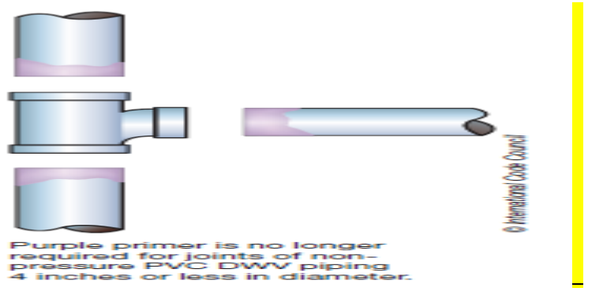
antifreeze. A multipurpose fire sprinkler system shall provide domestic water to both fire sprinklers and plumbing fixtures. A stand-alone sprinkler system shall be separate and independent from the water distribution system. ~~A backflow preventer shall not be required to separate a stand-alone sprinkler system from the water distribution system.~~	antifreeze. A multipurpose fire sprinkler system shall provide domestic water to both fire sprinklers and plumbing fixtures. A stand-alone sprinkler system shall be separate and independent from the water distribution system. ~~A backflow preventer shall not be required to separate a stand-alone sprinkler system from the water distribution system.~~	
P2904.3 Sprinkler piping system. Sprinkler piping shall be supported in accordance with the requirements for cold water distribution piping. Sprinkler piping shall comply with all requirements for cold water distribution piping. For multipurpose piping systems, the sprinkler piping shall connect to and be a part of the cold-water distribution piping system.	**P2904.3 Sprinkler piping system.** Sprinkler piping shall be supported in accordance with requirements for cold water distribution piping. Sprinkler piping shall comply with the requirements for cold water distribution piping. For multipurpose piping systems, the sprinkler piping shall connect to and be a part of the cold-water distribution piping system. **Exception:** For plastic piping, it shall be ~~permissible~~ required to follow either the manufacturer's installation instructions or the provisions of this code, whichever is more restrictive.	***City of Houston Amendment*** **Analysis:** The model code added an exception to the provisions of this section. City legal added a COH amendment eliminating permissive language and clarifying the code. **Justification:** An amendment is needed to clarify that sprinkler installations shall comply with the most restrictive of applicable code provisions.
N/A	**SECTION P2905** **HEATED WATER DISTRIBUTION SYSTEMS** **P2905.1 Heated Water Circulation Systems and Heat Trace Systems**. Circulation systems and heat trace systems, that are installed to bring heated water in close proximity to one or more fixtures, shall meet the requirements of Section N1103.5.1. **P2905.2 Demand Recirculation Systems.** Demand recirculation water systems shall be in accordance with Section N1103.5.2.  Heat trace temperature maintenance systems must comply with the energy efficiency provisions of Chapter 11 of the IRC.	***City of Houston Amendment*** **Analysis:** Pointers have been added to the IRC plumbing provisions to direct the user to the applicable energy conservation Provisions of IRC Chapter 11 related to heated water distribution systems. Section N1103.5 requires automatic controls to maintain hot water temperature for heated water circulation systems and for heat trace temperature maintenance systems when such systems are installed. *CHANGE SIGNIFICANCE: Although the origin of these requirements are in the International Energy Conservation Code (IECC) and they are reprinted in IRC Chapter 11, plumbing system designers and contractors are frequently responsible for selecting systems for hot water temperature maintenance using either circulating pumps or heat trace systems. Part of the selection of such systems might include the associated operating controls. For example, some pump systems can be supplied with integral controls. Heated water circulation and temperature maintenance systems are not required, but when installed they must meet the mandatory requirements of Section N1103.5. These systems use circulation pumps or heat trace components to maintain the desired temperature of hot water for the convenience of the user and to conserve water that would otherwise be drawn until hot water reached the fixture outlet. The new provisions in Section N1103.5 do not permit a continuously operating circulating pump. The pump must operate on automatic controls activated when the hot water in the system falls below the desired temperature or when there is a demand for hot water. Pipe insulation is required for hot water circulation systems and the water in the circulation piping can stay hot for an extended time depending on the diameter of the piping. Because the pump only operates intermittently when needed, demand-activated circulation is significantly more energy efficient than a continuously operating heated water circulation system. A heat trace system is the other energy-efficient means for maintaining the desired temperature in the service hot water system. The energy provisions require heat trace systems to comply with one of the referenced standards and to have automatic controls to conserve energy. As with circulation systems, piping in a heat trace system requires pipe insulation.* **Justification:** Model code changes were justified and adopted through the consensus process at the national hearings.
P2905.2 Lead content. Pipe and fittings used in the water-supply system shall have lead content of not greater than 8 percent lead.	~~**P2905.2**~~ **P2906.2 Lead Content.** The lead content in pipe and fittings used in the water-supply system shall ~~have lead content of~~ be not greater than 8 percent ~~lead~~. **P2906.2.1 Lead Content of Drinking Water Pipe and Fittings.** Pipe, pipe fittings, joints, valves, faucets, and fixture fittings utilized to supply water for drinking or cooking purposes shall comply with NSF 372 and shall have a weighted average lead content of 0.25 percent lead or less.	***City of Houston Amendment*** **Analysis:** Based on updated federal rules that went into effect 01/04/2014 changes were made to the IRC 2015 code to now include more stringent code provisions limiting lead content and the use of materials containing lead such as pipe, pipe fittings, joints, valves, faucets, and fixture fittings that convey water used for drinking and cooking. *CHANGE SIGNIFICANCE: A U.S. federal law was enacted to go into effect on January 4, 2014, requiring that pipe, pipe fittings, joints, valves, faucets, and fixture fittings that are used to supply water for drinking or cooking purposes have not more than 0.25 percent lead content, based on a weighted average of wetted surface areas. The 0.25 percent limitation does not apply to portions of the water distribution system that do not supply water for drinking or cooking. The existing 8 percent limitation is still in effect*

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
COLOR CODE INDEX: Turquoise = NEW or Modified Text by ICC in 2015; ~~Yellow Strike through~~ = Text Deleted from the Code by COH	Text Underlined = COH Amendment added (NEW); Green Text = NEW or Modified Text by COH in 2015	Grey Text = Previous COH Amendment Brought Forward to 2015; ~~Strike through~~ = Text Deleted from the Code by ICC
	 Pipe fittings used to supply water for drinking or cooking purposes must comply with NSF 372 and have not greater than 0.25 percent lead content. ICC ES PMG LOW LEAD © International Code Council Low lead third-party certification	*for those portions of the system. Realistically, in residential construction, entire water distribution systems will likely comply with the new threshold. Contractors are not likely to select products meeting different standards for a residential application. The new limit does not affect materials already in place. Products that are installed as part of a renovation must comply with the code and federal law.* *The 2015 IRC reflects the new federal law by requiring that the indicated products comply with the National Sanitation Foundation's standard NSF 372, which matches the lead content limitations set by federal law. It was developed as the basis for third-party certification agencies to verify and certify that products comply with the lead content limitation. Federal law does not require compliance with NSF 372 but sets the maximum lead content. Manufacturers, suppliers, distributers, and installers who do not comply with the federal law could face penalties for violations. Manufacturers are quickly working toward getting products third-party certified to NSF 372, as they are aware of the 2015 code requirements and compliance with NSF 372 will also demonstrate compliance with federal law. Neither NSF 372 nor the federal law require low-lead-compliant products to be marked or identified in any particular manner, and identification markings are not standardized between manufacturers or third-party certification agencies. However, the 2015 IRC and IPC requirements for third-party certification to NSF 372 will make it easier to verify compliance with the code. Although the federal law changes the previous requirement of the Safe Drinking Water Act with a threshold of 8 percent lead, to a maximum 0.25 percent lead, the 2015 IRC and IPC do not eliminate the 8 percent lead limitation. Products must still comply with the requirement of not more than 8 percent lead as determined by standard NSF 61. That standard requires evaluation of the product through chemical analysis of prepared test water that has been exposed to the product for a specified length of time. Evaluation of products for compliance with the low-lead federal law (and NSF 372) is by calculation method only.* **Justification:** The amendment correlates with IRC 2015 format.
P2905.8 Joint and connection tightness. Joints and connections in the plumbing system shall be gas tight and watertight for the intended use or required test pressure. No joints shall be permitted under slabs.	**P2906.8 Joint and connection tightness.** Joints and connections in the plumbing system shall be gas tight and watertight for the intended use or required test pressure. No joints shall be permitted under slabs.	***City of Houston Amendment*** **Analysis:** The model code and COH amendment was relocated to IRC 2015 Section P2906.8 from IRC 2012 Section P2905.8. ***No change to the previous code requirements or code intent.*** **Justification:** The amendment correlates with IRC 2015 format.
P2905.9.1.4 Cross-linked polyethylene plastic (PEX). Joints between cross-linked polyethylene plastic tubing or fittings shall comply with Section P2905.9.1.4.1 or Section P2905.9.1.4.2.	**P2906.9.1.5 Cross-linked polyethylene plastic (PEX).** Tubing and ~~J~~joints between cross-linked polyethylene plastic tubing or fittings shall comply with Section 2906.9.1.5.1 ~~or~~ through Section P2906.9.1.5.23.	***City of Houston Amendment*** **Analysis:** The provisions of this section in the model code was relocated from IRC 2012 Section P2905.9.1.4 to IRC 2015 Section P2906.9.1.5. COH amendment was added for clarity and to coordinate with other relocated and renumber sections. **Justification:** A CIC amendment has been approved for clarity.
N/A	**P2906.9.1.5.3 Tubing.** PEX tubing shall have a minimum chlorine designation code of 5 to meet minimum chlorine resistance at end use condition of 100% of the time at 140°F. Acceptable markings on the tubing are PEX 5106, PEX 5206, and PEX 5306.	***City of Houston Amendment*** **Analysis:** A COH amendment was added to address resistance from possible degradation of PEX plastic materials due to being exposed to chlorine and certain temperatures. **Justification:** COH amendment added due to technical concerns associated with degradation of PEX plastic CIC PC request approved by COH.
P2905.17.2 Plastic pipe or tubing to other piping material. Joints between different types of plastic pipe or between plastic pipe and other piping material shall be made with an approved adapter fitting. Plastic adapter fittings shall be male only.	**P2906.17.2 Plastic pipe or tubing to other piping material.** Joints between different types of plastic pipe or between plastic pipe and other piping material shall be made with an *approved* adapter fitting. Plastic adapter fittings shall be male only.	***City of Houston Amendment*** **Analysis:** The model code and COH amendment was relocated to IRC 2015 Section P2906.17.2 from IRC 2012 Section P2905.17.2. ***No change to the previous code requirements or code intent.*** **Justification:** The amendment was relocated to this section from P2905.17.2 of the IRC 2012. The COH amendment is retained for clarity.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
COLOR CODE INDEX: **Turquoise** = NEW or Modified Text by ICC in 2015 ~~**Yellow Strike through**~~ = Text Deleted from the Code by COH	**Text Underlined** = COH Amendment added (NEW) **Green Text** = NEW or Modified Text by COH in 2015	**Grey Text** = Previous COH Amendment Brought Forward to 2015 ~~**Strike through**~~ = Text Deleted from the Code by ICC
N/A	**P2910.1 Scope.** The provisions of either this section or the rules promulgated by the Texas Commission on Environmental Quality, whichever is more restrictive, shall govern the materials, design, construction, and installation of systems for the collection, storage, treatment, and distribution of nonpotable water. The use and application of nonpotable water shall comply with laws, rules, and ordinances applicable in the *jurisdiction*.	***City of Houston Amendment*** **Analysis:** New code provisions added to the model code. A COH amendment was added for clarity and to correlate with state law and TCEQ rules. **Justification:** An amendment is needed to reference state law.
N/A	**P2911.1 General.** The provisions of either this section or the rules promulgated by the Texas Commission on Environmental Quality, whichever is more restrictive, shall govern the construction, installation, alteration, and repair of on-site nonpotable water reuse systems for the collection, storage, treatment, and distribution of on-site sources of nonpotable water as permitted by the *jurisdiction*.	***City of Houston Amendment*** **Analysis:** New code provisions added to the model code. A COH amendment was added for clarity and to correlate with state law and TCEQ rules. **Justification:** An amendment is needed to reference state law.
N/A	**P2912.1 General.** The provisions of either this section or the rules promulgated by Texas Commission on Environmental Quality, whichever is more restrictive, shall govern the construction, installation, alteration, and repair of rainwater collection and conveyance systems for the collection, storage, treatment, and distribution of rainwater for nonpotable applications, as permitted by the *jurisdiction*.	***City of Houston Amendment*** **Analysis:** New code provisions added to the model code. A COH amendment was added for clarity and to correlate with state law and TCEQ rules. **Justification:** An amendment is needed to reference state law.
2012 Houston IRC – Chapter 30 Sanitary Drainage	**2015 Houston IRC – Chapter 30 Sanitary Drainage**	**Code Analysis**
P3001.3 Flood-resistant Installation. In flood hazard areas as established by Chapter 19 of the *City Code* ~~Table R301.2(1)~~, drainage, waste and vent systems shall be located and installed to prevent infiltration of floodwaters into the systems and discharges from the systems into floodwaters.	**P3001.3 Flood-resistant installation.** In flood hazard areas as established by Chapter 19 of the *City Code* ~~Table R301.2(1)~~, drainage, waste and vent systems shall be located and installed to prevent infiltration of floodwaters into the systems and discharges from the systems into floodwaters.	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** An amendment is needed to reference local code.
P3002.3.1 Drainage. Drainage fittings shall have a smooth interior waterway of the same diameter as the piping served. All fittings shall conform to the type of pipe used. Drainage fittings shall have no ledges, shoulders or reductions which can retard or obstruct drainage flow in the piping. Threaded drainage pipe fittings shall be of the recessed drainage type, cast iron ~~black~~ or galvanized. Drainage fittings shall be designed to maintain one-fourth unit vertical in 12 units horizontal (2-percent slope) grade. This section shall not be applicable to tubular waste fittings used to convey vertical flow upstream of the trap seal liquid level of a fixture trap.	**P3002.3.1 Drainage.** Drainage fittings shall have a smooth interior waterway of the same diameter as the piping served. Fittings shall conform to the type of pipe used. Drainage fittings shall not have ledges, shoulders or reductions that can retard or obstruct drainage flow in the piping. Threaded drainage pipe fittings shall be of the recessed drainage type, cast iron ~~black~~ or galvanized. Drainage fittings shall be designed to maintain one-fourth unit vertical in 12 units horizontal (2-percent slope) grade. This section shall not be applicable to tubular waste fittings used to convey vertical flow upstream of the trap seal liquid level of a fixture trap	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** An amendment is needed to ensure conformity with state and local government policy.
P3003.3.2 Solvent cementing. Joint surfaces shall be clean and free from moisture. Solvent cement that conforms to ASTM D 2235 or CSA B181.1 shall be applied to all joint surfaces. The joint shall be made while the cement is wet. Joints shall be made in accordance with ASTM D 2235, ASTM D 2661, ASTM F 628, or CSA B181.1. Solvent-cement joints shall be permitted above or below ground.	**P3003.9 ~~Coextruded Composite P3003.14~~ PVC Plastic.** Joints between ~~coextruded composite pipe with a PVC outer layer or~~ PVC plastic pipe or fittings shall comply with Sections P3003.9.1 through P3003.9.3. **P3003.9.1 Mechanical Joints.** (No change to text.) **P3003.9.2 Solvent cementing.** Joint surfaces shall be clean and free from moisture. A purple primer that conforms to ASTM F 656 shall be applied. Solvent cement not purple in color and conforming to ASTM D 2564, CSA B137.3 or CSA B181.2 shall be applied to all joint surfaces. The joint shall be made while the cement is wet and shall be in accordance with ASTM D 2855. Solvent cement joints shall be installed above or below ground. **~~Exception:~~** ~~A primer shall not be required where all of the following conditions apply:~~	***City of Houston Amendment*** **Analysis:** The application of a primer to drain, waste, and vent PVC pipe and fittings prior to solvent cementing is not required for 4-inch pipe size and smaller, provided that the piping is for a non-pressure application. Minor editorial changes added as a COH amendment deletes the exception allowing the elimination of cement primers. ***No change to the previous code requirements or code intent.*** *CHANGE SIGNIFICANCE: Recent testing by NSF International has indicated that where solvent cement conforming to ASTM D 2564 is used without primer to join PVC pipe and fittings 4 inches in diameter and smaller, the bonding forces of the connection are more than what is required for gravity drainage and waste systems, and vent systems for gravity drainage systems. The strength of joints made without primer often exceeds the pipe and fitting pressure capacity for both solid wall and cellular core types of pipes.* *The option to omit purple primer in assembling PVC DWV piping will simplify the installation and result in a more professional-looking finished product. The use of purple primer prior to solvent cementing PVC DWV fittings is often problematic where finished surfaces are in the vicinity. For example, tubs and shower stalls are often set in place during the plumbing rough-in stage. Work on plumbing rough-in piping above*

1. The solvent cement used is third party certified as conforming to ASTM D 2564.

2. The solvent cement is used only for joining PVC drain, waste and vent pipe and fittings in nonpressure applications in sizes up to and including 4 inches (102 mm) in diameter.



Purple primer is no longer required for joints of non-pressure PVC DWV piping 4 inches or less in diameter.

these finished products can be challenging when trying to avoid damaging the products. During the fixture set-out stage, pipe and fitting connections are often necessary in the vicinity of cabinetry, flooring, and other finish materials that could be damaged by purple primer. From an aesthetics point of view, piping covered with streaks of purple primer makes a piping job appear less than professional. Purple primer on piping visible to the occupant from within finished areas of the building is not appreciated by the building owner or occupant.

The separate pipe joining provisions for PVC solid wall piping (formerly in Section P3003.14) and PVC cellular core piping have been merged into a single Section P3003.9 titled "PVC Plastic." PVC pipe is manufactured using several different methods. The manufacturing method of a PVC pipe does not affect how the pipe is joined. All forms of PVC pipe are joined by the same methods.

Justification: This amendment is necessary due to local area climatic conditions which requires pipe connections to be clean and free of dirt and moisture. The continued use of primers will help to ensure connections will provide the necessary cement adhesion for proper strength and flow and to maintain consistency with current UPC section 705.5.2.

TABLE P3005.1
FITTINGS FOR CHANGE IN DIRECTION

TYPE OF FITTING PATTERN	CHANGE IN DIRECTION		
	HORIZONTAL TO VERTICAL[C]	VERTICAL TO HORIZONTAL	HORIZONTAL TO HORIZONTAL
Sixteenth bend	X	X	X
Eighth bend	X	X	X
Sixth bend	X	X	X
Quarter bend	X	~~X~~ a ~~--~~	~~X~~ a ~~--~~
Short sweep	X	X a, b	X a
Long sweep	X	X	X
Sanitary tee	X **c**	--	--
Wye	X	X	X
Combination wye and eighth bend	X	X	X

For SI: 1 inch = 25.4 mm.
a. The fittings shall only be permitted for a 2-inch or smaller fixture drain.
b. Three inches and larger.
c. For a limitation on multiple connection fittings, see Section P3005.1.1.

TABLE P3005.1
FITTINGS FOR CHANGE IN DIRECTION

TYPE OF FITTING PATTERN	CHANGE IN DIRECTION		
	HORIZONTAL TO VERTICAL C	VERTICAL TO HORIZONTAL	HORIZONTAL TO HORIZONTAL
Sixteenth bend	X	X	X
Eighth bend	X	X	X
Sixth bend	X	X	X
Quarter bend	X	~~X~~ a ~~--~~	X a
Short sweep	X	X a, b	X a
Long sweep	X	X	X
Sanitary tee	X **c**	--	--
Wye	X	X	X
Combination wye and eighth *bend*	X	X	X

For SI: 1 inch = 25.4 mm.
a. The fittings shall only be permitted for a 2-inch or smaller fixture drain.
b. Three inches ~~and~~ or larger.
c. For a limitation on multiple connection fittings, see *Plumbing Code* Section ~~P3005.1.1~~ 706.2.

City of Houston Amendment

Analysis: The existing amendment was modified to correlate with the *Houston Plumbing Code*. ***No change to the previous code requirements or code intent.***

Justification: This amendment is needed to ensure conformity with state and local government policy.

P3005.2 Drainage pipe cleanouts. Drainage pipe cleanouts shall comply with Sections P3005.2.1 through P3005.2.11.

P3005.2.1 – N/A

P3005.2.7 Building drain and building sewer junction. There shall be a cleanout near the junction of the building drain and building sewer. This cleanout shall be either inside or outside the building wall, provided that it is brought up to finish grade or to the lowest floor level. An approved two-way cleanout shall be permitted to serve as the required cleanout for both the building drain and the building sewer. The cleanout at the junction of the building drain and building sewer shall not be required where a cleanout on a

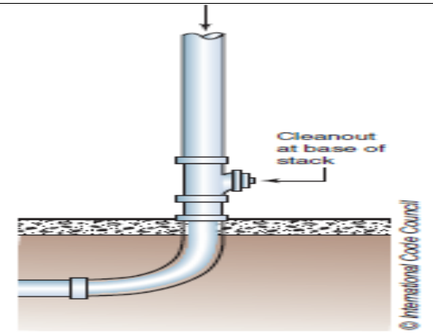
P3005.2 Cleanouts required. Cleanouts shall be provided for drainage piping in accordance with Sections P3005.2.1 through P3005.2.11.

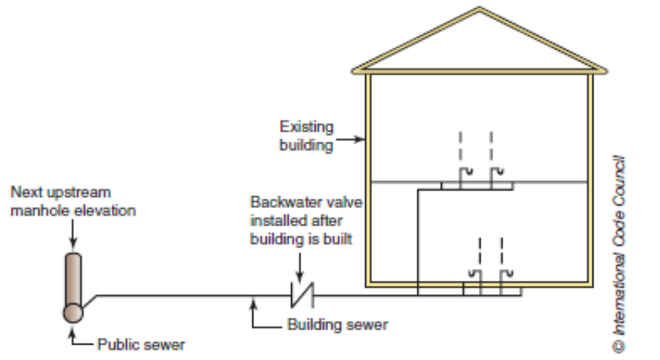
P3005.2.1 Horizontal drains and building drains. Horizontal drainage pipes in buildings shall have cleanouts located at intervals of not more than 100 feet (30,480 mm). *Building drains* shall have cleanouts located at intervals of not more than 100 feet (30,480 mm) except where manholes are used instead of cleanouts, the manholes shall be located at intervals of not more than ~~400 feet (122 m)~~ 300 feet (92 m). The interval length shall be measured from the cleanout or manhole opening, along the *developed length* of the piping to the

City of Houston Amendment

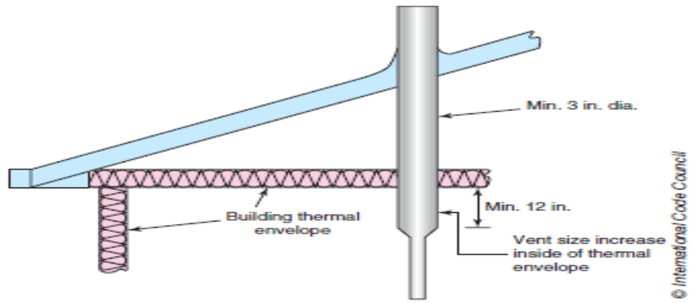
Analysis: The section on cleanouts has been completely reorganized and reworded for clarity. Brass cleanout plugs are only permitted for metallic piping. Where located at a finished wall, the cleanout must be within 1½ inches of the finished surface. A cleanout is no longer required at the base of each waste or soil stack.

A COH amendment was added to IRC 2015 P3005.2.1 to correlate with the *Houston Plumbing Code* Section 719.4. ***No change to the previous code requirements or code intent.***

3-inch (76 mm) or larger diameter soil stack is located within a developed length of 10 feet (3048 mm) of the building drain and building sewer junction. **P3005.2.6 Cleanout Plugs – N/A** **P3005.2.10 Cleanout Access – N/A**	next drainage fitting providing access for cleaning, the end of the horizontal drain or the end of the *building drain*. **Exception:** Horizontal fixture drain piping serving a nonremovable trap shall not be required to have a cleanout for the section of piping between the trap and the vent connection for such trap. **P3005.2.~~7~~.3 Building drain and building sewer junction.** ~~There shall be a cleanout near the junction of the building drain and building sewer. This cleanout shall be either inside or outside the building wall, provided that it is brought up to finish grade or to the lowest floor level. An approved two-way cleanout shall be permitted to serve as the required cleanout for both the building drain and the building sewer. The cleanout at the junction of the building drain and building sewer shall not be required where a cleanout on a 3-inch (76 mm) or larger diameter soil stack is located within a developed length of 10 feet (3048 mm) of the building drain and building sewer junction.~~ The junction of the building drain and the building sewer shall be served by a cleanout that is located at the junction or within 10 feet (3,048 mm) developed length of piping ~~**P3005.2.6 Base of Stacks.** A cleanout shall be provided at the base of each waste or soil stack.~~ **P3005.2.6 Cleanout Plugs.** Cleanout plugs shall be copper alloy, plastic, or other approved materials. Cleanout plugs for borosilicate glass piping systems shall be of borosilicate glass. Brass cleanout plugs shall conform to ASTM A 74 and shall be limited for use only on metallic piping systems. Plastic cleanout plugs shall conform to the referenced standards for plastic pipe fittings as indicated in Table P3002.3. Cleanout plugs shall have a raised square head, a countersunk square head or a countersunk slot head. Where a cleanout plug will have a trim cover screw installed into the plug, the plug shall be manufactured with a blind end threaded hole for such purpose. **P3005.2.10 Cleanout Access.** Required cleanouts shall not be installed in concealed locations. For the purposes of this section, concealed locations include, but are not limited to, the inside of plenums, within walls, within floor/ceiling assemblies, below grade and in crawl spaces where the height from the crawl space floor to the nearest obstruction along the path from the crawl space opening to the cleanout location is less than 24 inches (610 mm). Cleanouts with openings at a finished wall shall have the face of the opening located within 1½ inches (38 mm) of the finished wall surface. Cleanouts located below grade shall be extended to grade level so that the top of the cleanout plug is at or above grade. A cleanout installed in a floor or walkway that will not have a trim cover installed shall have a counter-sunk plug installed so the top surface of the plug is flush with the finished surface of the floor or walkway. *(Only portions of Section P3005.2 are shown for brevity and clarity.)*	 Cleanout on a stack *CHANGE SIGNIFICANCE: The reorganization and expansion of this section presents the material in a logical format that clarifies the requirements for cleanouts. There are several minor technical changes to the text to reflect current industry-accepted practices and to clarify the application of the cleanout provisions. The code has always allowed removal of a fixture trap or removal of a fixture with an integral trap, such as a water closet, in satisfying the location requirements for cleanouts. The code no longer describes specifically what may be used for cleanouts provided the location and access requirements are met. The industry-accepted practice of removing a water closet for cleanout purposes will continue. However, the code does now specifically prohibit removal of a water closet to serve as the required cleanout for the junction of the building drain to the building sewer.* *Brass cleanout plugs are limited to use with metallic piping and fittings. Over-tightening of a brass plug in a threaded plastic cleanout opening can easily crack the fitting. Where a cleanout is in a wall, the face of the cleanout opening must be within 1½ inches of the face of the wall for ease of access and to prevent damage to the wall finishes during rodding operations. Where a wall face is located farther away from the cleanout opening face, a large cleanout access opening panel could serve the same intent.* *Cleanouts in floors do not necessarily require specialized cleanout cover assemblies provided a counter-sunk cleanout plug is installed flush with the floor. However, where vehicular traffic is anticipated, cleanout assemblies in accordance with ASME A112.36.2M must be used.* *The requirement to provide a cleanout at the base of each waste or soil stack has been removed. Where multiple stacks discharge to a horizontal drainpipe, there is no need to require a cleanout for the base of every stack. There only needs to be one cleanout access at the most upstream end of the horizontal drainpipe (and every 100 feet from that point). The intent of the previous requirement was to make sure there was an access point for rodding every length of horizontal piping connected to the base of a stack. The requirement had nothing to do with stacks.* **Justification:** This amendment is needed to ensure conformity with state and local government policy.
P3005.2.8 Installation arrangement – N/A	**P3005.2.8 Installation arrangement.** The installation arrangement of a cleanout shall enable cleaning of drainage piping only in the direction of drainage flow~~.~~, unless using a ~~**Exceptions:**~~ ~~1. Test tees serving as cleanouts.~~	***City of Houston Amendment*** **Analysis:** A COH amendment was added to correlate with the *Houston Plumbing Code* Section 719.4. COH change eliminates “Test Tees” as cleanouts. **Justification:** This amendment is necessary to maintain consistency with Houston UPC 719.4.

	~~2. A~~ two-way cleanout installation that is *approved* for meeting the requirements of Section P3005.2.3.	
P3005.4.1 Branch and stack sizing. Branches and stacks shall be sized in accordance with Table P3005.4.1. Below grade drainpipes shall be not less than 2 inches (50 mm) ~~1½ inches (38 mm)~~ in diameter. Drain stacks shall be not smaller than the largest horizontal branch connected. **Exceptions:** **1.** A 4-inch by 3-inch (102 mm by 76 mm) closet bend or flange. **2.** A 4-inch (102 mm) closet bend connected to a 3-inch (76 mm) stack tee shall not be prohibited.	**P3005.4.1 Branch and stack sizing.** Branches and stacks shall be sized in accordance with Table P3005.4.1. Below grade drainpipes shall be not less than 2 inches (50 mm) ~~1½ inches (38 mm)~~ in diameter. Drain stacks shall be not smaller than the largest horizontal branch connected. **Exceptions:** **1.** A 4-inch by 3-inch (102 mm by 76 mm) closet bend or flange. **2.** A 4-inch (102 mm) closet bend connected to a 3-inch (76 mm) stack tee ~~shall not be prohibited~~.	***City of Houston Amendment*** **Analysis:** For clarity the previous COH amendment was modified to eliminate unnecessary text in exception #2. ***No change to the previous code requirements or code intent.*** **Justification:** Amendment needed to ensure consistency during code application and inspection and to coordinate conformity with the Houston amended Uniform Plumbing Code.
P3008.1 Sewage backflow. Where the flood level rims of plumbing fixtures are below the elevation of the manhole cover of the next upstream manhole in the public sewer, the fixtures shall be protected by a backwater valve installed in the *building drain*, branch of the *building drain* or horizontal branch serving such fixtures. Plumbing fixtures having flood level rims above the elevation of the manhole cover of the next upstream manhole in the public sewer shall not discharge through a backwater valve. **Exception – N/A**	**P3008.1 Sewage backflow.** Where the flood level rims of plumbing fixtures are below the elevation of the manhole cover of the next upstream manhole in the public sewer, the fixtures shall be protected by a backwater valve installed in the *building drain*, branch of the *building drain* or horizontal branch serving such fixtures. Plumbing fixtures having flood level rims above the elevation of the manhole cover of the next upstream manhole in the public sewer shall not discharge through a backwater valve. ~~**Exception:** In existing buildings, fixtures above the elevation of the manhole cover of the next upstream manhole in the *public sewer* shall not be prohibited from discharging through a backwater valve.~~  The exception allows this backwater valve arrangement only for existing buildings.	***City of Houston Amendment*** **Analysis:** Model code added a new exception to this section for existing buildings, where fixtures that are located above the next upstream manhole cover are allowed to discharge through a backwater valve. A COH amendment deletes this exception to correlate with provisions in the *Houston Plumbing Code*. ***No change to the previous code requirements or code intent.*** *CHANGE SIGNIFICANCE: A new exception specifically addresses a common problem encountered with installation of a backwater valve for an existing building. Existing buildings built before the code began requiring backwater valves for fixtures on floor levels below the elevation of the next upstream manhole cover are at risk for sewage backflows caused by public sewer problems. In some cases, many years will pass without the public sewer creating a fixture overflow in an existing building. As more building sewer connections are made to the public sewer and as stormwater infiltration increases as the public sewer ages, surcharging and clogs in the public sewer can develop. Usually, a building owner will experience only one sewage overflow in the building before consulting with a plumbing contractor to provide a solution to protect against these costly and unsettling events.* *However, installation of a backwater valve after a building is built presents the problem of how to separate the drainage flow from fixtures on floors below the next upstream manhole cover from the fixtures on floors above the next upstream manhole cover. The drainage piping within the building is so integral to the construction of the building that separation of the drainage flows for installation of a backwater valve in accordance with the code is impossible. The new exception allows, for existing buildings only, installation of a backwater valve for all fixtures in a building, even if those fixtures are on a floor above the next upstream manhole cover elevation. A building owner should have the ability to protect his or her property from public sewer surcharging that could cause backflow and damage in the building. Without a backwater valve installed in these situations, multiple overflow events and property damage could continue to occur unabated.* **Justification:** An amendment is needed to maintain consistency with current UPC section 710.1.
SECTION P3009 **GRAY WATER RECYCLING SYSTEMS** **P3009.1 Scope.** The provisions of Section P3009 shall govern the materials, design, construction and installation of gray water systems for flushing of water closets and urinals and for subsurface landscape irrigation. See Figures P3009.1(1) and P3009.1(2).	**SECTION P3009** **GRAY WATER RECYCLING SYSTEMS** **P3009.1 Scope.** The provisions of this section or the rules promulgated by the Texas Commission of Environmental Quality, whichever is more restrictive, shall govern the materials, design, construction and installation of subsurface landscape irrigation systems connected to nonpotable water from on-site water reuse systems.	***City of Houston Amendment*** **Analysis:** A COH amendment was added to correlate with state TCEQ rules for installations of Grey Water Systems. ***No change to the previous code requirements or code intent.*** **Justification:** An amendment is needed to reference state law.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
COLOR CODE INDEX:	**Turquoise** = NEW or Modified Text by ICC in 2015 ~~**Yellow Strike through**~~ = Text Deleted from the Code by COH	**Text Underlined** = COH Amendment added (NEW) **Green Text** = NEW or Modified Text by COH in 2015	**Grey Text** = Previous COH Amendment Brought Forward to 2015 ~~**Strike through**~~ = Text Deleted from the Code by ICC

P3103.1 Roof extension. Open vent pipes that extend through a roof shall be terminated not less than 6 inches (152 mm) above the roof or 6 inches (152 mm) above the anticipated snow accumulation, whichever is greater, except that where a roof is to be used for any purpose other than weather protection, the vent extension shall be run not less than 7 feet (2,134 mm) above the roof. **P3103.2 Frost closure.** Where the 97.5-percent value for outside design temperature is 0°F (-18°C) or less, every vent extension through a roof or wall shall be not less than 3 inches (76 mm) in diameter. Any increase in the size of the vent shall be made inside the structure not less than 1 foot (305 mm) below the roof or inside the wall.	**P3103.1 Roof Extension.** Open vent pipes that extend through a roof shall be terminated not less than 6 inches (152 mm) above the roof or 6 inches (152 mm) above the anticipated snow accumulation, whichever is greater~~, except that~~. ~~w~~Where a roof is to be used for ~~any purpose other than weather protection,~~ assembly, as a promenade, observation deck, sunbathing deck or for similar purposes, open vent ~~extension~~ pipes shall ~~be run~~ terminate not less than 7 feet (2,134 mm) above the roof. **P3103.2 Frost Closure.** Where the 97.5-percent value for outside design temperature is 0°F (218°C) or less, ~~every~~ vent extensions through a roof or wall shall be not less than 3 inches (76 mm) in diameter. Any increase in the size of the vent shall be made ~~inside the structure~~ not less than 1 foot ~~below the roof or inside the wall~~ inside the thermal envelope of the building.  Vent terminal requirements to prevent frost closure in cold climates	***City of Houston Amendment*** **Analysis:** Where a minimum 3-inch diameter vent terminal is required to prevent frost blockage in cold climates, the 3-inch diameter pipe must extend at least 12 inches inside the building's thermal envelope. The minimum 7-foot height requirement for vent terminations applies only to roofs used for purposes like residential decks, patios, and balconies. *CHANGE SIGNIFICANCE: Section P3103.1 requiring a 7-foot vent extension above the roof when the roof was used for any purpose other than weather protection was sometimes interpreted literally to require extension of roof vent terminals where the roof was used for mounting equipment such as HVAC units, solar panels, or antennas. The original intent of the section was to only require vent extension to 7 feet where the roof was to be used by people, like how they use a deck or patio. The purpose was to elevate the vent terminal and the level of discharge of sewer gases above people's heads. This requirement is not necessary for where workers are temporarily installing, repairing, or replacing rooftop-mounted equipment or where roofs might be used for people escaping the interior of a building in an emergency. The code is now clear that the intent is to require the vent extension if the roof is used for people to gather or enjoy the outdoors such as occurs with an observation deck or sunbathing deck.* *Section P3103.2 has long required vent terminals of not less than 3 inches in diameter where the outside design temperature is 0 degrees Fahrenheit or less. The intent is to prevent frost blockage, and 3-inch-diameter pipe performs well for that purpose. Where the code does not require a 3-inch vent—for example, a 2-inch kitchen or bathroom vent the vent size must be increased before the vent penetrates through the roof. In this case, the code has always prescribed that the transition to a larger pipe size must occur at least 1 foot below the roof. However, recent reports from building owners in cold areas have indicated vent pipe blockage and damage from freezing condensate when the transition from a smaller pipe size to a 3-inch vent terminal occurs in an unconditioned attic area below the roof. In most attics, the attic temperature is very near the outdoor temperature, and frost closure can occur in smaller vent pipes. In these cold climates, the 2015 IPC requires smaller vent pipes to transition to the 3-inch diameter starting at not less than 1 foot inside the building's thermal envelope. In other words, the vent enlargement must occur at least 1 foot inside the heated zone of the building, typically measured from the insulated ceiling of the topmost story.* **Justification:** This amendment is needed to ensure conformity with state and local government policy.
P3114.3 Where permitted. Individual vents~~, branch vents, circuit vents and stack vents~~ shall be permitted to terminate with a connection to *an air admittance valve*. Individual and branch type air admittance valves shall vent only fixtures that are on the same floor level and connect to a horizontal branch drain.	**P3114.3 Where permitted.** Individual vents~~, branch vents, circuit vents and stack vents~~ shall be permitted to terminate with a connection to *an air admittance valve*. Individual and branch type air admittance valves shall vent only fixtures that are on the same floor level and connect to a horizontal branch drain.	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
P3114.4 Location. ~~Individual and branch~~ The *air admittance valves* shall be located ~~not less than 4 inches (102 mm) above the horizontal branch drain or *fixture drain* being vented. Stack-type air admittance valves shall be located~~ not less than 6 inches (152 mm) above the flood level rim of the ~~highest~~ fixture ~~being vented~~. The *air admittance valve* shall be located within the maximum *developed length* permitted for the vent. The *air admittance valve* shall be installed not less than 6 inches (152 mm) above insulation materials where installed in *attics*.	**P3114.4 Location.** ~~Individual and branch~~ The *air admittance valves* shall be located ~~not less than 4 inches (102 mm) above the horizontal branch drain or *fixture drain* being vented. Stack-type air admittance valves shall be located~~ not less than 6 inches (152 mm) above the flood level rim of the ~~highest~~ fixture being vented. The *air admittance valve* shall be located within the maximum *developed length* permitted for the vent. The *air admittance valve* shall be installed not less than 6 inches (152 mm) above insulation materials where installed in *attics.*	***City of Houston Amendment*** **Analysis:** The previous COH amendment includes minor editorial changes. ***No change to the previous code requirements or code intent.*** **Justification:** An amendment is needed to ensure conformity with state and local government policy. ***The 2012 IRC was modified by Ord. 2015-1316 to modify this section.***
2012 Houston IRC – Chapter 32 Traps	**2015 Houston IRC – Chapter 32 Traps**	**Code Analysis**
P3201.2 Trap seals and trap seal protection. Traps shall have a liquid seal not less than 2 inches (51 mm) and not more than 4 inches (102 mm). Traps for floor drains shall be fitted with a trap primer or shall be of the deep seal design. Trap seal primer valves shall connect to the trap at a point above the level of the trap seal.	**P3201.2 Trap Seals.** ~~**and Trap Seal Protection.**~~ Each fixture trap shall have a liquid seal of not less than 2 inches (51 mm) and not more than 4 inches (102 mm). ~~Traps for floor drains shall be fitted with a trap primer or shall be of the deep seal design. Trap seal primer valves shall connect to the trap at a point above the level of the trap seal~~.	***City of Houston Amendment*** **Analysis:** Trap seal protection against evaporation can now be accomplished in a variety of ways, including trap seal primer valves supplied with nonpotable water and barrier-type trap seal protection devices. *CHANGE SIGNIFICANCE: Section P3201.2 was expanded to cover two additional types of trap seal protection devices and to distinguish between the different types of water-supplied trap seal protection*

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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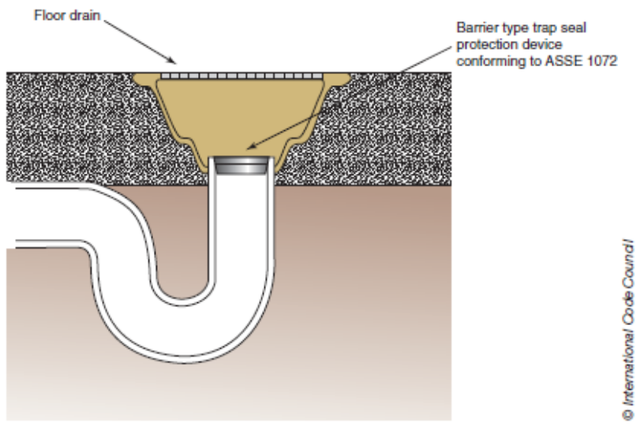

A barrier-type trap seal protection device is one of four methods of protecting the floor drain trap seal from evaporation.

P3201.2.1 Trap Seal Protection. Trap seals of emergency floor drain traps and traps subject to evaporation shall be protected by one of the methods in Sections P3201.2.1.1 through P3201.2.1.4.

P3201.2.1.1 Potable Water-Supplied Trap Seal Primer Valve. A potable water-supplied trap seal primer valve shall supply water to the trap. Water-supplied trap seal primer valves shall conform to ASSE 1018. The discharge pipe from the trap seal primer valve shall connect to the trap above the trap seal on the inlet side of the trap.

P3201.2.1.2 Reclaimed or Gray-Water-Supplied Trap Seal Primer Valve. A reclaimed or gray-water-supplied trap seal primer valve shall supply water to the trap. Water-supplied trap seal primer valves shall conform to ASSE 1018. The quality of reclaimed or gray water supplied to trap seal primer valves shall be in accordance with the requirements of the manufacturer of the trap seal primer valve. The discharge pipe from the trap seal primer valve shall connect to the trap above the trap seal on the inlet side of the trap.

P3201.2.1.3 Waste-Water-Supplied Trap Primer Device. A waste-water-supplied trap primer device shall supply water to the trap. Waste-water-supplied trap primer devices shall conform to ASSE 1044. The discharge pipe from the trap seal primer device shall connect to the trap above the trap seal on the inlet side of the trap.

P3201.2.1.4 Barrier-Type Trap Seal Protection Device. A barrier-type trap seal protection device shall protect the floor drain trap seal from evaporation. Barrier-type floor drain trap seal protection devices shall conform to ASSE 1072. The devices shall be installed in accordance with the manufacturer's instructions.

devices. Potable-water-supplied trap seal devices have been an industry standard for decades. However, with greater reliance on alternate sources of nonpotable water such as reclaimed water and gray water, the quality of those types of water has a bearing on the performance of water-supplied trap devices. The manufacturer of those devices must be consulted where alternate sources of water are supplied to the devices.

Waste-water-supplied trap primer devices have been used in the plumbing industry for some time, and because they are covered in standard ASSE 1044, they have been code-approved for over a decade. However, these simple and effective trap primer devices were overlooked because the code identified the products only by referring to the standard that they complied with.

The latest trap seal protection device is for floor drains only and utilizes a specially designed and tested insert below the floor drain strainer plate. When water runs into the floor drain, the insert allows the water to pass and then closes to significantly reduce evaporation of the trap seal.

Justification: This amendment reflects changes to base code that negate the need for note "a".

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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TABLE P3201.7
SIZE OF TRAPS AND TRAP ARMS FOR PLUMBING FIXTURES

PLUMBING FIXTURE	TRAP SIZE MINIMUM (inches)
Bathtub (with or without shower head and/or whirlpool attachments)	2 ~~1½~~
Bidet	1 ¼
Clothes washer standpipe	2
Dishwasher (on separate trap)	1½
Floor drain	2
Kitchen sink (one or two traps, with or without dishwasher and garbage grinder)	1½
Laundry tub (one or more compartments)	1½
Lavatory	1 ¼
Shower (based on the total flow rate through showerheads and body sprays) Flow rate: 5.7 gpm and less More than 5.7 gpm up to 12.3 gpm More than 12.3 gpm up to 25.8 gpm More than 25.8 gpm up to 55.6 gpm	 1½ 2 3 4
Water closet	3 ~~Note a~~

For SI: 1 inch= 25.4 mm.

~~a. Consult fixture standards for trap dimensions of specific bowls.~~

TABLE P3201.7
SIZE OF TRAPS AND TRAP ARMS FOR *PLUMBING FIXTURES*

PLUMBING FIXTURE	TRAP SIZE MINIMUM (inches)
Bathtub (with or without shower head and/or whirlpool attachments)	2 ~~1½~~
Bidet	1 ¼
Clothes washer standpipe	2
Dishwasher (on separate trap)	1½
Floor drain	2
Kitchen sink (one or two traps, with or without dishwasher and food *waste* disposer)	1½
Laundry tub (one or more compartments)	1½
Lavatory	1 ¼
Shower (based on the total flow rate through showerheads and body sprays) Flow rate: 5.7 gpm and less More than 5.7 gpm up to 12.3 gpm More than 12.3 gpm up to 25.8 gpm More than 25.8 gpm up to 55.6 gpm	 ~~1½~~ 2 2 3 4
Water closet	3

For SI: 1 inch = 25.4 mm.

City of Houston Amendment

Analysis: The existing amendment was modified to correlate with minimum provisions of the *Houston Plumbing Code* and other changes to the model code.

Justification: This amendment reflects changes to base code that negate the need for note "a".

2012 Houston IRC Part VIII—Electrical (Chapters 34 – 43)	2015 Houston IRC Part VIII—Electrical (Chapters 34 – 43)	Code Analysis

Part 8—Electrical (Chapters 34 – 43)

■ *Chapter 34 General Requirements* No changes addressed; ■ *Chapter 35 Electrical Definitions* No changes addressed; ■ *Chapter 36 Services* No changes addressed; ■ *Chapter 37 Branch Circuit and Feeder Requirements* No changes addressed; ■ *Chapter 38 Wiring Methods* No changes addressed; ■ *Chapter 39 Power and Lighting Distribution;* ■ *Chapter 40 Devices and Luminaires* No changes addressed; ■ *Chapter 41 Appliance Installation* No changes addressed ■ *Chapter 42 Swimming Pools;* ■ *Chapter 43 Class 2 Remote-Control, Signaling and Power-Limited Circuits* No changes addressed

The electrical part of the IRC is extracted, by permission, from NFPA 70 *National Electrical Code* (NEC) published by the National Fire Protection Association (NFPA). The corresponding NEC section number appears in brackets at the end of each IRC section. Appendix Q of the IRC also provides a cross reference for the section numbers of each code. Similar to the mechanical, fuel gas, and plumbing parts of the IRC, Part 8 is divided into several chapters, starting with general requirements applicable to all residential electrical systems and followed by chapters of technical provisions covering design and installation. Chapter 34 covers general requirements such as component identification, equipment location, clearances, protection from damage, and conductor connections. Chapter 35 of the IRC provides definitions specific to electrical installations and supplements (and in some cases supersedes) the general definitions found in Chapter 2. Subsequent chapters cover electrical services, branch circuits, feeders, wiring methods, outlet locations, receptacles, lighting fixtures, and appliance installation for electrical systems of buildings under the scope of the IRC. A separate chapter covers the unique hazards and special requirements related to electrical installations for swimming pools, hot tubs, and whirlpool bathtubs. Limited-voltage circuits are addressed in Chapter 43. ■

E3901.9-Receptacle Outlets for Garages; E3902.8, E3902.9, E3902.10-Ground-Fault Circuit Interrupter Protection; E4203.4.3-Location of Low-Voltage Luminaires Adjacent to Swimming Pools; E4204.2-Bonding of Outdoor Hot Tubs and Spas;

Part VIII—Electrical {**EDITOR'S NOTE: DELETE** CHAPTERS 34-43 IN THEIR ENTIRETY.}	***Part VIII—Electrical*** {**EDITORIAL NOTE:** DELETE CHAPTERS 34-43 IN THEIR ENTIRETY.}	***City of Houston Amendment*** **Analysis:** No changes were made to this COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** An amendment is needed to ensure conformity with state and local government policy.

2012 Houston IRC – Chapter 44 Referenced Standards	2015 Houston IRC – Chapter 44 Referenced Standards	Code Analysis
N/A	**CHAPTER 44** **REFERENCED STANDARDS** {**EDITORIAL NOTE:** PORTIONS OF THIS CHAPTER NOT SHOWN SHALL REMAIN AS SET FORTH IN THE 2015 IRC.} **ASTM** ASTM International 100 Barr Harbor Drive West Conshohocken, PA 19428-2959	***City of Houston Amendment*** **Analysis:** A COH amendment was added to update specific referenced standard to the latest editions for added life-safety and to correlate with other volumes of the *Houston Construction Code and State Law*. **Justification:** An amendment is needed to ensure conformity with state and local government policy.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

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Standard Reference Number	Title	Referenced in code section number
E 84—2013a	Test Method for Surface Burning Characteristics of Building Materials	R202, R302.9.3, R302.9.4, R302.10.1, R302.10.2, R316.3, R316.5.9, R316.5.11, R507.3.2, R802.1.5, M1601.3, M1601.5.2
E 90—09(2016)	Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements	N104.1, N105.1

NFPA National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471

Standard Reference number	Title	Referenced in code section number
70—~~2014~~2017	National Electrical Code	108.3, 415.11.1.8, 904.3.1, 907.6.1, 909.12.2, 909.16.3, 1205.4.1, 2701.1, 2702.1.2, G501.4, G1001.6, H106.1, H106.2, K101, K111.1, ~~E3401.1, E3401.2, E4301.1, Table E4303.2, E4304.3, E4304.4,~~ R324.3
241—19	Standard for Safeguarding Construction, Alteration, and Demolition Operations	3301.1

2012 Houston IRC Part 9—Appendices (Appendix A through S)	2015 Houston IRC Part 9—Appendices (Appendix A through S)	Code Analysis

Part 9—Appendices (Appendix A through S)

■ *Appendix A through Q No changes addressed;* ■ *Appendix R Light Straw-Clay Construction;* ■ *Appendix S Strawbale Construction*

As stated in Chapter 1 of the IRC, provisions in the appendices do not apply unless specifically referenced in the adopting ordinance. The appendices are developed in much the same manner as the main body of the model code. However, the appendix information is judged to be outside the scope and purpose of the code at the time of code publication. Many times an appendix offers supplemental information, alternative methods, or recommended procedures. The information may also be specialized and applicable or of interest to only a limited number of jurisdictions. Although an appendix may provide some guidelines or examples of recommended practices or assist in the determination of alternative materials or methods, it will have no legal status and cannot be enforced until it is specifically recognized in the adopting legislation. Appendix chapters or portions of such chapters that gain general acceptance over time can move into the main body of the model code through the code-development process. The 2015 IRC introduces two new appendix chapters that reflect the growing awareness and acceptance of green and sustainable construction practices. Appendix R covers light straw-clay construction and Appendix S covers strawbale construction. ■ Appendix R-Light Straw-Clay Construction; Appendix S-Strawbale Construction

2012 Houston IRC – Appendix A (A, B, C, H, L, M and V)	2015 Houston IRC – Appendix A (A, B, C, H, K, L, M, Q, T, U, and V)	Code Analysis

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
COLOR CODE INDEX: **Turquoise** = NEW or Modified Text by ICC in 2015 ~~**Yellow Strike through**~~ = Text Deleted from the Code by COH	**Text Underlined** = COH Amendment added (NEW) **Green Text** = NEW or Modified Text by COH in 2015	**Grey Text** = Previous COH Amendment Brought Forward to 2015 ~~**Strike through**~~ = Text Deleted from the Code by ICC

APPENDIX A **SIZING AND CAPACITIES OF GAS PIPING** (~~This appendix is informative and is not part of the *code.*~~ This appendix is an excerpt from the *2012 International Fuel Gas Code*, coordinated with the section numbering of the *International Residential Code*.) {**EDITOR'S NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2012 IRC.}	**APPENDIX A** **SIZING AND CAPACITIES OF GAS PIPING** **(~~This appendix is informative and is not part of the *code.*~~ This appendix is an excerpt from the 2015 *International Fuel Gas Code*, coordinated with the section numbering of the *International Residential Code.*)** {**EDITORIAL NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2015 IRC.}	***City of Houston Amendment*** **Analysis:** The existing amendment has been modified to correlate with current code editions. ***No change to the previous code requirements or code intent.*** **Justification:** An amendment is necessary to reference the correct code that applies to the appendix.
2012 Houston IRC – Appendix B (A, B, C, H, L, M and V)	**2015 Houston IRC – Appendix B (A, B, C, H, K, L, M, Q, T, U, and V)**	**Code Analysis**
APPENDIX B **SIZING OF VENTING SYSTEMS SERVING APPLIANCES EQUIPPED WITH DRAFT HOODS, CATEGORY I APPLIANCES, AND APPLIANCES LISTED FOR USE WITH TYPE B VENTS** (~~This Appendix is informative and is not part of the Code.~~ This appendix is an excerpt from the *2012 International Fuel Gas Code,* coordinated with the section numbering of the *International Residential Code)* {**EDITOR'S NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2012 IRC.}	**APPENDIX B** **SIZING OF VENTING SYSTEMS SERVING APPLIANCES EQUIPPED WITH DRAFT HOODS, CATEGORY I APPLIANCES, AND APPLIANCES LISTED FOR USE WITH TYPE B VENTS** **(~~This appendix is informative and is not part of the *code.*~~ This appendix is an excerpt from the 2015 *International Fuel Gas Code*~~, coordinated with the section numbering of the *International Residential Code.*~~)** {**EDITORIAL NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2015 IRC.}	***City of Houston Amendment*** **Analysis:** The existing amendment has been modified to correlate with current code editions. ***No change to the previous code requirements or code intent.*** **Justification:** An amendment is necessary to reference the correct code that applies to the appendix.
2012 Houston IRC – Appendix C (A, B, C, H, L, M and V)	**2015 Houston IRC – Appendix C (A, B, C, H, K, L, M, Q, T, U, and V)**	**Code Analysis**
APPENDIX C **EXIT TERMINAL OF MECHANICAL DRAFT AND DIRECT-VENT VENTING SYSTEMS** (~~This appendix is informative and is not part of the Code.~~ This appendix is an excerpt from the *2012 International Fuel Gas Code,* coordinated with the section numbering of the *International Residential Code.)* {**EDITOR'S NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2012 IRC.}	**APPENDIX C** **EXIT TERMINALS OF MECHANICAL DRAFT AND DIRECT-VENT VENTING SYSTEMS** **(~~This appendix is informative and is not part of the *code.*~~ This appendix is an excerpt from the 2015 *International Fuel Gas Code*~~, coordinated with the section numbering of the *International Residential Code.*~~)** {**EDITORIAL NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2015 IRC.}	***City of Houston Amendment*** **Analysis:** The existing amendment has been modified to correlate with current code editions. ***No change to the previous code requirements or code intent.*** **Justification:** An amendment is necessary to reference the correct code that applies to the appendix.
2012 Houston IRC – Appendix H (A, B, C, H, L, M and V)	**2015 Houston IRC – Appendix H (A, B, C, H, K, L, M, Q, T, U, and V)**	**Code Analysis**
APPENDIX H **PATIO COVERS** ~~(This provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.)~~ {**EDITOR'S NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2012 IRC.}	**APPENDIX H** **PATIO COVERS** **(*The provisions contained in this appendix are ~~not~~ mandatory ~~unless specifically referenced in the adopting ordinance.~~*)** {**EDITORIAL NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2015 IRC.}	***City of Houston Amendment*** **Analysis:** The existing amendment has been modified to correlate with current code editions. ***No change to the previous code requirements or code intent.*** **Justification:** An amendment is necessary to reference the correct code that applies to the appendix.
2012 Houston IRC – Appendix K (A, B, C, H, L, M and V)	**2015 Houston IRC – Appendix K (A, B, C, H, K, L, M, Q, T, U, and V)**	**Code Analysis**
APPENDIX K **SOUND TRANSMISSION** ***(The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.)***	**APPENDIX K** **SOUND TRANSMISSION** ***(The provisions contained in this appendix are ~~not~~ mandatory ~~unless specifically referenced in the adopting ordinance.~~)***	***City of Houston Amendment*** **Analysis:** A new COH amendment is added to adopt the sound mitigating provisions of the IRC 2015 model code Appendix K for multifamily structures only as defined in the *Houston Construction Code* (IE: Townhouses). **Justification:** Adoption of this appendix is necessary for multifamily structures only (Townhouses).
SECTION AK101	**SECTION AK101**	***City of Houston Amendment***

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
COLOR CODE INDEX: **Turquoise** = NEW or Modified Text by ICC in 2015 ~~**Yellow Strike through**~~ = Text Deleted from the Code by COH	**Text Underlined** = COH Amendment added (NEW) **Green Text** = NEW or Modified Text by COH in 2015	**Grey Text** = Previous COH Amendment Brought Forward to 2015 ~~**Strike through**~~ = Text Deleted from the Code by ICC
GENERAL **AK101.1 General.** Wall and floor-ceiling assemblies separating *dwelling units*, including those separating adjacent *townhouse* units, shall provide air-borne sound insulation for walls, and both air-borne and impact sound insulation for floor-ceiling assemblies.	**GENERAL** **AK101.1 General.** Wall and floor-ceiling assemblies separating *dwelling units* in multi-family residential structures, including those separating adjacent *townhouse* units, shall provide air-borne sound insulation for walls, and both air-borne and impact sound insulation for floor-ceiling assemblies.	**Analysis:** A new COH amendment is added to adopt the sound mitigating provisions of the IRC 2015 model code Appendix K for multifamily structures only as defined in the *Houston Construction Code* (IE: Townhouses). **Justification:** Adoption of this appendix is necessary for multifamily structures only (Townhouses).
N/A	{**EDITORIAL NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2015 IRC.}	***City of Houston Amendment*** **Analysis:** A COH amendment was added. **Justification:** Adoption of this appendix is necessary for duplexes.
2012 Houston IRC – Appendix L (A, B, C, H, L, M and V)	**2015 Houston IRC – Appendix L (A, B, C, H, K, L, M, Q, T, U, and V)**	**Code Analysis**

Analysis based on the following Files:

2021-1037 Exhibit G-1 2015 IRC Final-MH
2015 IRC

2012 IRC, Print 13
2012 Houston Amendments-ALL

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary

COLOR CODE INDEX: Turquoise = NEW or Modified Text by ICC in 2015; ~~Yellow Strike through~~ = Text Deleted from the Code by COH; **Text Underlined** = COH Amendment added (NEW); Green Text = NEW or Modified Text by COH in 2015; Grey Text = Previous COH Amendment Brought Forward to 2015; ~~Strike through~~ = Text Deleted from the Code by ICC

APPENDIX L **~~PERMIT FEES~~** {**EDITORIAL NOTE**: **DELETE** ENTIRE APPENDIX AND REPLACE WITH THE FOLLOWING.} **CONVENTIONAL LIGHT-FRAME WOOD CONSTRUCTION FOR SINGLE FAMILY RESIDENTIAL CONSTRUCTION IN HIGH-WIND AREAS**	**APPENDIX L** **~~PERMIT FEES~~** {**EDITORIAL NOTE:** DELETE ENTIRE APPENDIX AND REPLACE WITH THE FOLLOWING.} **CONVENTIONAL LIGHT-FRAME WOOD CONSTRUCTION FOR SINGLE FAMILY RESIDENTIAL CONSTRUCTION IN HIGH-WIND AREAS**	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
SECTION AL101 **GENERAL** **AL101.1 Scope.** This chapter applies to regular-shaped single family residential buildings that are not more than three stories in height and are of conventional light-frame construction. **Exception:** Detached carports and garages not exceeding 700 square feet (65 m²) and accessory to Group R-3 occupancies need only comply with the roof-member-to-wall-tie requirements of Section AL103.8.	**SECTION AL101** **GENERAL** **AL101.1 Scope.** This chapter applies to regular-shaped single family residential buildings that are not more than three stories in height and are of conventional light-frame construction. **Exception:** Detached carports and garages not exceeding 700 square feet (65 m²) and accessory to Group R-3 occupancies need only comply with the roof-member-to-*wall*-tie requirements of Section AL 103.8.	***City of Houston Amendment*** **Analysis:** No changes were made to the previous COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
SECTION AL102 **DEFINITION** **CORROSION RESISTANT or NONCORROSIVE.** Refers to a material having a corrosion resistance equal to or greater than a hot-dipped galvanized coating of 1.5 ounces of zinc per square foot (4 g/m^2) of surface area. When an element is required to be corrosion resistant or noncorrosive, all of its parts, such as screws, nails, wire, dowels, bolts, nuts, washers, shims, anchors, ties and attachments, shall also be corrosion resistant or noncorrosive.	**SECTION AL102** **DEFINITION** **CORROSION RESISTANT or NONCORROSIVE.** Refers to a material having a *corrosion resistance* equal to or greater than a hot-dipped galvanized coating of 1.5 ounces of zinc per square foot (4 g/m²) of surface area. When an element is required to be corrosion resistant or noncorrosive, all of its parts, such as screws, nails, wire, dowels, bolts, nuts, washers, shims, *anchors*, ties and attachments, shall also be corrosion resistant or noncorrosive.	***City of Houston Amendment*** **Analysis:** No changes were made to the previous COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
SECTION AL103 **COMPLETE LOAD PATH AND UPLIFT TIES** **AL103.1 General.** Blocking, bridging, straps, approved framing anchors or mechanical fasteners shall be installed to provide continuous ties from the roof to the foundation system. Tie straps shall be 1⅛-inch (28.6 mm) by 0.036-inch (0.91 mm) (No. 20 gage) sheet steel and shall be corrosion resistant as herein specified. All metal connectors and fasteners used in exposed locations or in areas otherwise subject to corrosion shall be of corrosion-resistant or noncorrosive material. The number of common nails specified is the total required and shall be equally divided on each side of the connection. Nails shall be spaced to avoid splitting of the wood. **Exception:** Pre-manufactured connectors that provide equal or greater tie-down capacity may be used, provided that they are installed in compliance with all the manufacturer's specifications.	**SECTION AL103** **COMPLETE LOAD PATH AND UPLIFT TIES** **AL103.1 General.** Blocking, bridging, straps, approved framing anchors or mechanical fasteners shall be installed to provide continuous ties from the roof to the foundation system. Tie straps shall be 1 1/8-inch (28.6 mm) by 0.036-inch (0.91 mm) (No. 20 gauge) sheet steel and shall be corrosion resistant as herein specified. All metal connectors and fasteners used in exposed locations or in areas otherwise subject to corrosion shall be of corrosion-resistant or noncorrosive material. The number of common nails specified is the total required and shall be equally divided on each side of the connection. Nails shall be spaced to avoid splitting of the wood. **Exception:** Pre-manufactured connectors that provide equal or greater tie-down capacity may be used, provided that they are installed in compliance with all the manufacturer's specifications.	***City of Houston Amendment*** **Analysis:** No changes were made to the previous COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
AL103.2 Wall-to-foundation tie. Exterior walls shall be tied to a continuous foundation system or an elevated foundation system in accordance with Section AL105.	**AL103.2 Wall-to-foundation tie.** Exterior walls shall be tied to a continuous foundation system or an elevated foundation system in accordance with Section AL105.	***City of Houston Amendment*** **Analysis:** No changes were made to the previous COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
AL103.3 Sills and foundation tie. Foundation plates resting on concrete or masonry foundations shall be bolted to the foundation with not less than ½-inch-diameter (13 mm) anchor bolts with 7-inch-minimum (178 mm)	**AL103.3 Sills and foundation tie.** Foundation plates resting on concrete or masonry foundations shall be bolted to the foundation with not less than ½ inch	***City of Houston Amendment*** **Analysis:** Minor editorial change made to the previous COH amendment. ***No change to the previous code requirements or code intent.***

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
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embedment into the foundation and spaced not more than 4 feet (1219 mm) on center.	diameter (13 mm) anchor bolts with 7 inch (178 mm) minimum embedment into the foundation and spaced not more than 4 feet (1,219 mm) on center.	**Justification:** This amendment is needed to ensure conformity with state and local government policy.
AL103.4 Floor-to-foundation tie. The lowest-level exterior wall studs shall be connected to the foundation sill plate or an approved elevated foundation system with bent tie straps spaced not more than 32 inches (813 mm) on center. Tie straps shall be nailed with a minimum of 4 ten penny nails.	**AL103.4 Floor-to-foundation tie.** The lowest level exterior wall studs shall be connected to the foundation sill plate or an approved elevated foundation system with bent tie straps spaced not more than 32 inches (813 mm) on center. Tie straps shall be nailed with a minimum of 4 ten penny nails.	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
AL103.5 Wall framing details. The spacing of studs in exterior walls shall be in accordance with Chapter 23. Mechanical fasteners complying with this chapter shall be installed at a maximum of 32 inches (813 mm) on center as required to connect studs to the sole plates, foundation sill plate and top plates of the wall. The fasteners shall be nailed with a minimum of 8 eight penny nails. Where openings exceed 4 feet (1219 mm) in width, the required tie straps shall be at each edge of the opening and connected to a doubled full-height wall stud. When openings exceed 12 feet (3658 mm) in width, two ties at each connection or a manufactured fastener designed to prevent uplift shall be provided.	**AL103.5 Wall framing details.** The spacing of studs in exterior walls shall be in accordance with Chapter 23. Mechanical fasteners complying with this chapter shall be installed at a maximum of 32 inches (813 mm) on center as required to connect studs to the sole plates, foundation sill plate and top plates of the wall. The fasteners shall be nailed with a minimum of 8 eight penny nails. Where openings exceed 4 feet (1,219 mm) in width, the required tie straps shall be secured at each edge of the opening and connected to a doubled full-height wall stud. When openings exceed 12 feet (3,658 mm) in width, two ties or a manufactured fastener designed to prevent uplift shall be provided at each connection.	***City of Houston Amendment*** **Analysis:** Minor editorial change made to the previous COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
AL103.6 Wall sheathing. All exterior walls and required interior main cross-stud partitions shall be sheathed in accordance with Chapter 23.	**AL103.6 Wall sheathing.** All exterior walls and required interior main cross-stud partitions shall be sheathed in accordance with Chapter 6.	***City of Houston Amendment*** **Analysis:** Minor editorial change made to the previous COH amendment to reference correct chapter. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
AL103.7 Floor-to-floor tie. Upper-level exterior wall studs shall be aligned and connected to the wall studs below with tie straps placed a minimum of 32 inches (813 mm) on center and connected with a minimum of 6 eight penny nails per strap.	**AL103.7 Floor-to-floor tie.** Upper-level exterior wall studs shall be aligned and connected to the wall studs below with tie straps placed a minimum of 32 inches (813 mm) on center and connected with a minimum of 6 eight penny nails per strap.	***City of Houston Amendment*** **Analysis:** No changes were made to the previous COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
AL103.8 Roof-members-to-wall tie. Tie straps shall be provided from the side of the roof-framing member to the supporting member below the roof. Tie straps shall be placed at every roof-framing member and connected with a minimum of 8 eight penny nails.	**AL103.8 Roof-members-to-wall tie.** Tie straps shall be provided from the side of the roof-framing member to the supporting member below the roof. Tie straps shall be placed at every roof framing member and connected with a minimum of 8 eight penny nails.	***City of Houston Amendment*** **Analysis:** No changes were made to the previous COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
AL103.9 Ridge ties. Opposing common rafters shall be aligned at the ridge and be connected at the rafters with tie straps spaced a maximum of 32 inches (813 mm) on center and connected with 8 eight penny nails.	**AL103.9 Ridge ties.** Opposing common rafters shall be aligned at the ridge and be connected at the rafters with tie straps spaced a maximum of 32 inches (813 mm) on center and connected with 8 eight penny nails.	***City of Houston Amendment*** **Analysis:** No changes were made to the previous COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
AL103.10 Gable-end walls. Gable-end wall studs shall be continuous between points of lateral support that are perpendicular to the plane of the wall. Gable-end wall studs shall be attached with approved mechanical fasteners at the top and bottom. Eight 8 penny nails shall be required for each fastener. Fasteners shall be spaced a maximum of 32 inches (813 mm) on center.	**AL103.10 Gable end walls.** Gable end wall studs shall be continuous between points of lateral support that are perpendicular to the plane of the wall. Gable end wall studs shall be attached with approved mechanical fasteners at the top and bottom. 8 eight penny nails shall be required for each fastener. Fasteners shall be spaced a maximum of 32 inches (813 mm) on center.	***City of Houston Amendment*** **Analysis:** No changes were made to the previous COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
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SECTION AL104 **ROOFS**	**SECTION AL104** **ROOFS**	***City of Houston Amendment***
AL104.1 Roof sheathing. Solid roof sheathing shall be applied and shall consist of a minimum 1-inch-thick (25.4 mm) nominal lumber applied diagonally or a minimum 15/32-inch-thick (11.9 mm) wood structural panel or particle board (OSB) or other approved sheathing applied with the long dimension perpendicular to supporting rafters. Sheathing shall be nailed to roof framing in an approved manner. The end joints of wood structural panels or particle board shall be staggered and shall occur over blocking, rafters, or other supports.	**AL104.1 Roof sheathing.** Solid roof sheathing shall be nailed to roof framing in an approved manner and shall consist of a minimum 1-inch thick (25.4 mm) nominal lumber applied diagonally or a minimum 15/32-inch thick (11.9 mm) wood structural panel or particle board (OSB) or other approved sheathing applied with the long dimension perpendicular to supporting rafters. The end joints of wood structural panels or particle board shall be staggered and shall occur over blocking, rafters, or other supports.	**Analysis:** Minor editorial change made to the previous COH amendment for additional clarity. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
AL104.2 Roof covering. Roof coverings shall be approved and shall be installed and fastened in accordance with Chapter 15 and with the manufacturer's instructions.	**AL104.2 Roof covering.** Roof coverings shall be approved and shall be installed and fastened in accordance with Chapter 9 or with the manufacturer's instructions, whichever is most restrictive.	***City of Houston Amendment*** **Analysis:** Minor editorial change made to the previous COH amendment to reference correct chapter. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
AL104.3 Roof overhang. The roof eave overhang shall not exceed 3 feet (914 mm) unless an analysis is provided showing that the required resistance is provided to prevent uplift. The roof overhang at gabled ends shall not exceed 2 feet (610 mm) unless an analysis showing that the required resistance to prevent uplift is provided.	**AL104.3 Roof overhang.** The roof eave overhang shall not exceed 3 feet (914 mm) unless an analysis is provided showing that the required resistance is provided to prevent uplift. The roof overhang at gabled ends shall not exceed 2 feet (610 mm) unless an analysis showing that the required resistance to prevent uplift is provided.	***City of Houston Amendment*** **Analysis:** No changes were made to the previous COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
SECTION AL105 **ELEVATED FOUNDATION**	**SECTION AL105** **ELEVATED FOUNDATION**	***City of Houston Amendment***
AL105.1 General. When approved, elevated foundations supporting not more than one story and meeting the provisions of this section may be used. A foundation investigation may be required by the *building official*.	**AL105.1 General.** When approved, elevated foundations supporting not more than one *story* and meeting the provisions of this section may be used. A foundation investigation may be required by the *building official.*	**Analysis:** No changes were made to the previous COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
AL105.2 Material. All exposed wood-framing members shall be treated wood. All metal connectors and fasteners used in exposed locations shall be corrosion-resistant or noncorrosive steel.	**AL105.2 Material.** All exposed wood framing members shall be treated wood. All metal connectors and fasteners used in exposed locations shall be corrosion-resistant or noncorrosive steel.	***City of Houston Amendment*** **Analysis:** No changes were made to the previous COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
AL105.3 Wood piles. The spacing of wood piles shall not exceed 8 feet (2438 mm) on center. Square piles shall not be less than 10 inches (254 mm) and tapered piles shall have a tip of not less than 8 inches (203 mm). Eight-inch-square (5161 mm²) piles shall have a minimum embedment length of 5 feet (1524 mm) and shall project not more than 8 feet (2438 mm) above undisturbed ground surface. Eight-inch (203 mm) taper piles shall have a minimum embedment length of 6 feet (1828 mm) and shall project not more than 7 feet (2134 mm) above undisturbed ground surface.	**AL105.3 Wood piles.** The spacing of wood piles shall not exceed 8 feet (2,438 mm) on center. Square piles shall not be less than 10 inches (254 mm) and tapered piles shall have a tip of not less than 8 inches (203 mm). Eight-inch square (5,161 mm²) piles shall have a minimum embedment length of 5 feet (1,524 mm) and shall project not more than 8 feet (2,438 mm) above undisturbed ground surface. Eight-inch (203 mm) taper piles shall have a minimum embedment length of 6 feet (1,828 mm) and shall project not more than 7 feet (2,134 mm) above undisturbed ground surface.	***City of Houston Amendment*** **Analysis:** No changes were made to the previous COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
AL105.4 Girders. Floor girders shall consist of solid sawn timber, built-up 2-inch-thick (51 mm) lumber, or trusses. Splices shall occur over wood piles. The floor girders shall span in the direction parallel to the potential floodwater and wave action.	**AL105.4 Girders.** Floor girders shall consist of solid sawn timber, built up 2-inch thick (51 mm) lumber, or trusses. Splices shall occur over wood piles. The floor girders shall span in the direction parallel to the potential floodwater and wave action.	***City of Houston Amendment*** **Analysis:** No changes were made to the previous COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
AL105.5 Connections. Wood piles may be notched to provide a shelf for supporting the floor girders. The total notching shall not exceed 50 percent of the pile cross section. Approved bolted connections with ¼-inch (6.4 mm) corrosion-resistant or noncorrosive steel plates and ¾-inch-diameter (19 mm) bolts shall be provided. Each end of the girder shall be connected to the piles using a minimum of two ¾-inch-diameter (19 mm) bolts.	**AL105.5 Connections.** Wood piles may be notched to provide a shelf for supporting the floor girders. The total notching shall not exceed 50 percent of the pile cross section. Approved bolted connections with ¼ inch (6.4 mm) corrosion-resistant or noncorrosive steel plates and ¾ inch diameter (19 mm)	***City of Houston Amendment*** **Analysis:** No changes were made to the previous COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.

	bolts shall be provided. Each end of the girder shall be connected to the piles using a minimum of two ¾ inch diameter (19 mm) bolts.	
2012 Houston IRC – Appendix M (A, B, C, H, L, M and V)	**2015 Houston IRC – Appendix M (A, B, C, H, K, L, M, Q, T, U, and V)**	**Code Analysis**
APPENDIX M **~~HOME DAY CARE-R-3 OCCUPANCY~~** **N/A** – {**EDITOR'S NOTE: REPLACE APPENDIX M** WITH THE FOLLOWING.} **AIRPORT SOUND ATTENUATION REQUIREMENTS**	**APPENDIX M** **HOME DAY CARE—R3 OCCUPANCY** ***(The provisions contained in this appendix are ~~not mandatory~~ ~~unless specifically referenced in the adopting ordinance~~.)***	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments has been relocated to IRC 2015 "Appendix Q" as a COH Amendment. New IRC 2015 Appendix M has been amended and adopted at the request of the Fire Marshal with a few COH amendments. The model code text of this appendix is highlighted green to show it is a COH amendment new to the IRC 2015. **Justification:** Appendix M has been amended and adopted at the request of the Fire Marshal to address Group R3 residential day care facilities.
N/A – {**EDITOR'S NOTE: REPLACE APPENDIX M** WITH THE FOLLOWING.} **AIRPORT SOUND ATTENUATION REQUIREMENTS**	**SECTION AM101** **GENERAL** **AM101.1 General.** This appendix shall apply to a home day care operated within a dwelling. **The area of application shall** include buildings and structures occupied by persons of any age who receive custodial care for less than 24 hours by individuals other than parents~~,~~ ~~or~~ guardians or relatives by blood, marriage, or adoption, and in a place other than the home of the person cared for. {**EDITORIAL NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2015 IRC.}	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments has been relocated to IRC 2015 "Appendix Q" as a COH Amendment. New IRC 2015 Appendix M has been amended and adopted at the request of the Fire Marshal. **Justification:** Appendix M has been amended and adopted at the request of the Fire Marshal to address Group R3 residential day care facilities.
N/A – {**EDITOR'S NOTE: REPLACE APPENDIX M** WITH THE FOLLOWING.} **AIRPORT SOUND ATTENUATION REQUIREMENTS**	**SECTION AM102** **DEFINITION** **EXIT ACCESS.** That portion of a means-of-egress system that leads from any occupied point in a building or structure to an exit.	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments has been relocated to IRC 2015 "Appendix Q" as a COH Amendment. New IRC 2015 Appendix M has been amended and adopted at the request of the Fire Marshal. **Justification:** Appendix M has been amended and adopted at the request of the Fire Marshal to address Group R3 residential day care facilities.
N/A – {**EDITOR'S NOTE: REPLACE APPENDIX M** WITH THE FOLLOWING.} **AIRPORT SOUND ATTENUATION REQUIREMENTS**	**SECTION AM103** **MEANS OF EGRESS** **AM103.1 Exits required.** If the occupant load of the residence is more than nine, including those who are residents, during the time of operation of the day care, two exits are required from the ground-level *story*. Two exits are required from a home day care operated in a *manufactured home* regardless of the occupant load. Exits shall comply with Section R311.	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments has been relocated to IRC 2015 "Appendix Q" as a COH Amendment. New IRC 2015 Appendix M has been amended and adopted at the request of the Fire Marshal. **Justification:** Appendix M has been amended and adopted at the request of the Fire Marshal to address Group R3 residential day care facilities.
N/A – {**EDITOR'S NOTE: REPLACE APPENDIX M** WITH THE FOLLOWING.} **AIRPORT SOUND ATTENUATION REQUIREMENTS**	**AM103.1.1 Exit access prohibited.** An exit access from the area of day care operation shall not pass-through bathrooms, bedrooms, closets, garages, fenced rear yards or similar areas. **Exception:** An exit may discharge into a fenced yard if the gate or gates remain unlocked during day care hours. The gates may be locked if there is an area of refuge located within the fenced yard and more than 50 feet (15,240 mm) from the dwelling. The area of refuge shall be large enough to allow 5 square feet (0.5 m^2) per occupant.	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments has been relocated to IRC 2015 "Appendix Q" as a COH Amendment. New IRC 2015 Appendix M has been amended and adopted at the request of the Fire Marshal. **Justification:** Appendix M has been amended and adopted at the request of the Fire Marshal to address Group R3 residential day care facilities.
N/A – {**EDITOR'S NOTE: REPLACE APPENDIX M** WITH THE FOLLOWING.} **AIRPORT SOUND ATTENUATION REQUIREMENTS**	**AM103.1.2 Basements.** If the basement of a dwelling is to be used in the day care operation, two exits are required from the basement regardless of	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments has been relocated to IRC 2015 "Appendix Q" as a COH Amendment. New IRC 2015 Appendix M has been amended and adopted at the request of the Fire Marshal.

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
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	the occupant load. One of the exits may pass through the dwelling and the other must lead directly to the exterior of the dwelling. **Exception:** An emergency and escape window complying with Section R310, and which does not conflict with Section AM103.1.1 may be used as the second means of egress from a basement.	**Justification:** Appendix M has been amended and adopted at the request of the Fire Marshal to address Group R3 residential day care facilities.
N/A – {**EDITOR'S NOTE: REPLACE APPENDIX M** WITH THE FOLLOWING.} **AIRPORT SOUND ATTENUATION REQUIREMENTS**	**AM103.1.3 Yards.** If the yard is to be used as part of the day care operation it shall be fenced.	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments has been relocated to IRC 2015 "Appendix Q" as a COH Amendment. New IRC 2015 Appendix M has been amended and adopted at the request of the Fire Marshal. **Justification:** Appendix M has been amended and adopted at the request of the Fire Marshal to address Group R3 residential day care facilities.
N/A – {**EDITOR'S NOTE: REPLACE APPENDIX M** WITH THE FOLLOWING.} **AIRPORT SOUND ATTENUATION REQUIREMENTS**	**AM103.1.3.1 Type of fence and hardware.** The fence shall be of durable materials and be at least 6 feet (1529 mm) tall, completely enclosing the area used for the day care operations. Each opening shall be a gate or door equipped with a self-closing and self-latching device to be installed at a minimum of 5 feet (1528 mm) above the ground. **Exception:** The door of any dwelling which forms part of the enclosure need not be equipped with self-closing and self-latching devices.	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments has been relocated to IRC 2015 "Appendix Q" as a COH Amendment. New IRC 2015 Appendix M has been amended and adopted at the request of the Fire Marshal. **Justification:** Appendix M has been amended and adopted at the request of the Fire Marshal to address Group R3 residential day care facilities.
N/A – {**EDITOR'S NOTE: REPLACE APPENDIX M** WITH THE FOLLOWING.} **AIRPORT SOUND ATTENUATION REQUIREMENTS**	**AM103.1.3.2 Construction of fence.** Openings in the fence, wall or enclosure required by this section shall have intermediate rails or an ornamental pattern that do not allow a sphere 4 inches (102 mm) in diameter to pass through. In addition, the following criteria must be met: **1.** The maximum vertical clearance between grade and the bottom of the fence, wall or enclosure shall be 2 inches (51 mm). **2.** Solid walls or enclosures that do not have openings, such as masonry or stone walls, shall not contain indentations or protrusions, except for tooled masonry joints. **3.** Maximum mesh size for chain link fences shall be 11/4 inches (32 mm) square unless the fence has slats at the top or bottom which reduce the opening to no more than 13/4 inches (44 mm). The wire shall be not less than 9 gage [0.148 inch (3.8 mm)].	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments has been relocated to IRC 2015 "Appendix Q" as a COH Amendment. New IRC 2015 Appendix M has been amended and adopted at the request of the Fire Marshal. **Justification:** Appendix M has been amended and adopted at the request of the Fire Marshal to address Group R3 residential day care facilities.
N/A – {**EDITOR'S NOTE: REPLACE APPENDIX M** WITH THE FOLLOWING.} **AIRPORT SOUND ATTENUATION REQUIREMENTS**	**AM103.1.3.3 Decks.** Decks that are more than 12 inches (305 mm) above grade shall have a guard in compliance with Section R312.	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments has been relocated to IRC 2015 "Appendix Q" as a COH Amendment. New IRC 2015 Appendix M has been amended and adopted at the request of the Fire Marshal. **Justification:** Appendix M has been amended and adopted at the request of the Fire Marshal to address Group R3 residential day care facilities.
N/A – {**EDITOR'S NOTE: REPLACE APPENDIX M** WITH THE FOLLOWING.} **AIRPORT SOUND ATTENUATION REQUIREMENTS**	**AM103.2 Width and height of an exit.** The minimum width of a required exit is 36 inches (914 mm) with a net clear width of 32 inches (813 mm). The minimum height of a required exit is 6 feet, 8 inches (2,032 mm).	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments has been relocated to IRC 2015 "Appendix Q" as a COH Amendment. New IRC 2015 Appendix M has been amended and adopted at the request of the Fire Marshal. **Justification:** Appendix M has been amended and adopted at the request of the Fire Marshal to address Group R3 residential day care facilities.
N/A – {**EDITOR'S NOTE: REPLACE APPENDIX M** WITH THE FOLLOWING.} **AIRPORT SOUND ATTENUATION REQUIREMENTS**	**AM103.3 Type of lock and latches for exits.** Regardless of the occupant load served, exit doors shall be openable from the inside without the use of a key or any special knowledge or effort. When the occupant load is 10 or less,	***City of Houston Amendment***

	a night latch, dead bolt or security chain may be used, provided such devices are openable from the inside without the use of a key or tool, and mounted at a height not to exceed 48 inches (1,219 mm) above the finished floor.	**Analysis:** Previous IRC 2012 "Appendix M" COH Amendments has been relocated to IRC 2015 "Appendix Q" as a COH Amendment. New IRC 2015 Appendix M has been amended and adopted at the request of the Fire Marshal. **Justification:** Appendix M has been amended and adopted at the request of the Fire Marshal to address Group R3 residential day care facilities.
N/A – {**EDITOR'S NOTE: REPLACE APPENDIX M** WITH THE FOLLOWING.} **AIRPORT SOUND ATTENUATION REQUIREMENTS**	**AM103.4 Landings.** Landings for stairways and doors shall comply with Section R311, except that landings shall be required for the exterior side of a sliding door when a home day care is being operated in a Group R-3 occupancy.	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments has been relocated to IRC 2015 "Appendix Q" as a COH Amendment. New IRC 2015 Appendix M has been amended and adopted at the request of the Fire Marshal. **Justification:** Appendix M has been amended and adopted at the request of the Fire Marshal to address Group R3 residential day care facilities.
N/A – {**EDITOR'S NOTE: REPLACE APPENDIX M** WITH THE FOLLOWING.} **AIRPORT SOUND ATTENUATION REQUIREMENTS**	**SECTION AM104** **SMOKE DETECTION** **AM104.1 General.** Smoke detectors shall be installed in dwelling units used for home day care operations. Detectors shall be installed in accordance with the approved manufacturer's instructions. If the current smoke detection system in the dwelling is not in compliance with the currently adopted code for smoke detection, it shall be upgraded to meet the currently adopted code requirements and Section AM103 before day care operations commence.	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments has been relocated to IRC 2015 "Appendix Q" as a COH Amendment. New IRC 2015 Appendix M has been amended and adopted at the request of the Fire Marshal. **Justification:** Appendix M has been amended and adopted at the request of the Fire Marshal to address Group R3 residential day care facilities.
N/A – {**EDITOR'S NOTE: REPLACE APPENDIX M** WITH THE FOLLOWING.} **AIRPORT SOUND ATTENUATION REQUIREMENTS**	**AM104.2 Power source.** Required smoke detectors shall receive their primary power from the building wiring when that wiring is served from a commercial source and shall be equipped with a battery backup. The detector shall emit a signal when the batteries are low. Wiring shall be permanent and without a disconnecting switch other than those required for overcurrent protection. Required smoke detectors shall be interconnected so if one detector is activated, all detectors are activated.	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments has been relocated to IRC 2015 "Appendix Q" as a COH Amendment. New IRC 2015 Appendix M has been amended and adopted at the request of the Fire Marshal. **Justification:** Appendix M has been amended and adopted at the request of the Fire Marshal to address Group R3 residential day care facilities.
N/A – {**EDITOR'S NOTE: REPLACE APPENDIX M** WITH THE FOLLOWING.} **AIRPORT SOUND ATTENUATION REQUIREMENTS**	**AM104.3 Location.** A detector shall be located in each bedroom and any room that is to be used as a sleeping room, and centrally located in the corridor, hallway or area giving access to each separate sleeping area. When the dwelling unit has more than one story, and in dwellings with basements, a detector shall be installed on each story and in the basement. In dwelling units where a story or basement is split into two or more levels, the smoke detector shall be installed on the upper level, except that when the lower level contains a sleeping area, a detector shall be installed on each level. When sleeping rooms are on the upper level, the detector shall be placed at the ceiling of the upper level in close proximity to the stairway. In dwelling units where the ceiling height of a room open to the hallway serving the bedrooms or sleeping areas exceeds that of the hallway by 24 inches (610 mm) or more, smoke detectors shall be installed in the hallway and the adjacent room. Detectors shall sound an alarm audible in all sleeping areas of the dwelling unit in which they are located.	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments has been relocated to IRC 2015 "Appendix Q" as a COH Amendment. New IRC 2015 Appendix M has been amended and adopted at the request of the Fire Marshal. **Justification:** Appendix M has been amended and adopted at the request of the Fire Marshal to address Group R3 residential day care facilities.

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2012 Houston IRC – Appendix M (A, B, C, H, L, M and V)	2015 Houston IRC – Appendix Q (A, B, C, H, K, L, M, Q, T, U, and V)	Code Analysis
APPENDIX M ~~**HOME DAY CARE-R-3 OCCUPANCY**~~ {**EDITOR'S NOTE:** **REPLACE APPENDIX M** WITH THE FOLLOWING.} **AIRPORT SOUND ATTENUATION REQUIREMENTS**	**APPENDIX Q** ~~**RESERVED**~~ **AIRPORT SOUND ATTENUATION REQUIREMENTS**	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments have been relocated to IRC 2015 "Appendix Q" as a COH Amendment. ***No change to the previous code requirements or code intent.*** **Justification:** "Appendix M" 2012 IRC Amendments is now "Appendix Q" 2015 IRC Amendments.
SECTION AM101 **GENERAL** **AM101.1 Purpose.** The purpose of this appendix to set forth sound attenuation specifications for buildings when such sound attenuation is required by Chapter 9, Article VI, of the *City Code* to achieve an interior sound level of 45 dBA. **AM101.2 Applicability.** These provisions shall apply under circumstances where an airport land use permit is required under Section 9-381(a)(2) or (3) of the *City Code*, and are in addition to other applicable building standards set forth elsewhere in this code. **AM101.3 Alternate compliance.** Alternative means or methods which equal or exceed the standards set forth in these provisions may be used when approved by the *building official* in accordance with section R104.9 of this code.	**SECTION AQ101** **GENERAL** **AQ101.1 Purpose.** The purpose of this appendix is to set forth sound attenuation specifications for buildings when such sound attenuation is required by Chapter 9, Article VI, of the *City Code* to achieve an interior sound level of 45 dBa or less. **AQ101.2 Applicability.** These provisions shall apply where an airport land use *permit* is required under Section 9-381(a)(2) or (3) of the *City Code* and are in addition to other applicable building standards set forth elsewhere in this code. **AQ101.3 Alternate compliance.** Alternative means or methods which equal or exceed the standards set forth in these provisions may be used when approved by the *building official* in accordance with section R104.11.	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments have been relocated to IRC 2015 "Appendix Q" as a COH Amendment. ***No change to the previous code requirements or code intent.*** **Justification:** "Appendix M" 2012 IRC Amendments is now "Appendix Q" 2015 IRC Amendments.
SECTION AM201 **DEFINITIONS** **AM201.1 Definitions.** For purposes of these provisions, the following words shall have the meaning shown herein. **SOUND TRANSMISSION CLASS (STC).** An integer rating relating to the quality of sound attenuation for building partitions such as walls, ceilings, doors, and windows.	**SECTION AQ201** **DEFINITIONS** **AQ201.1 Definitions.** For the purposes of these provisions, the following words have the meaning shown herein. **SOUND TRANSMISSION CLASS (STC).** An integer rating relating to the quality of sound attenuation for building partitions such as walls, ceilings, doors, and windows.	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments have been relocated to IRC 2015 "Appendix Q" as a COH Amendment. ***No change to the previous code requirements or code intent.*** **Justification:** "Appendix M" 2012 IRC Amendments is now "Appendix Q" 2015 IRC Amendments.
SECTION AM301 **WALLS** **AM301.1 General.** The specific exterior wall assemblies set forth in Sections AM301.2 and AM301.3 shall include the interior finishes set forth therein. **Exception:** Exterior wall assemblies or materials that have been tested or listed with a minimum STC rating of 40. **AM301.2 Brick veneer.** When exterior walls are constructed using brick veneer, a minimum of ½ inch gypsum drywall shall be applied as the interior finish. **AM301.3 Vinyl or cement sidings.** When exterior walls are constructed using vinyl or cement sidings, a minimum of ⅝ inch gypsum drywall shall be applied as the interior finish. **AM301.4 Other assemblies and materials.** All other exterior wall assemblies or materials shall have a tested or listed minimum STC rating of 40.	**SECTION AQ301** **WALLS** **AQ301.1 General.** The specific exterior wall assemblies set forth in Sections AQ301.2 and AQ 301.3 shall include the interior finishes set forth therein. **Exception:** Exterior wall assemblies or materials that have been tested or *listed* with a minimum STC rating of 40 need not include the interior finishes set forth in Sections AQ301.2 and AQ 301.3. **AQ301.2 Brick veneer.** When exterior walls are constructed using brick veneer, a minimum of ½ inch gypsum drywall shall be applied as the interior finish. **AQ301.3 Vinyl or cement sidings.** When exterior walls are constructed using vinyl or cement sidings, a minimum of 5/8 inch gypsum drywall shall be applied as the interior finish. **AQ301.4 Other assemblies and materials.** All other exterior wall assemblies or materials shall have a tested or *listed* minimum STC rating of 40.	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments have been relocated to IRC 2015 "Appendix Q" as a COH Amendment. Minor editorial changes included for clarity. ***No change to the previous code requirements or code intent.*** **Justification:** "Appendix M" 2012 IRC Amendments is now "Appendix Q" 2015 IRC Amendments.

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SECTION AM401 **WINDOWS** **AM401.1 Windows.** All windows shall have a minimum STC rating of 40 when tested in accordance with ASTM E 90. **AM401.2 Insulation at windows.** The cavity between the wood framing and the window frame shall be insulated with fiberglass insulation or foam insulation to the depth of the window frame.	**SECTION AQ401** **WINDOWS** **AQ401.1 Windows.** All windows shall have a minimum STC rating of 40 when tested in accordance with ASTM E 90. **AQ401.2 Insulation at windows.** The cavity between the wood framing and the window frame shall be insulated with fiberglass insulation or foam insulation to the depth of the window frame.	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments have been relocated to IRC 2015 "Appendix Q" as a COH Amendment. ***No change to the previous code requirements or code intent.*** **Justification:** "Appendix M" 2012 IRC Amendments is now "Appendix Q" 2015 IRC Amendments.
SECTION AM501 **DOORS** **AM501.1 Doors.** All exterior doors shall have a minimum STC rating of 40 when tested in accordance with ASTM E 90. **Exception:** An exterior door may have a tested or listed STC rating of less than 40 when installed with a storm door which when combined, achieve a minimum tested or listed STC rating of 40.	**SECTION AQ501** **DOORS** **AQ501.1 Doors.** All exterior doors shall have a minimum STC rating of 40 when tested in accordance with ASTM E 90. **Exception:** An exterior door may have a tested or *listed* STC rating of less than 40 when installed with a storm door which when combined, achieve a minimum tested or *listed* STC rating of 40.	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments have been relocated to IRC 2015 "Appendix Q" as a COH Amendment. ***No change to the previous code requirements or code intent.*** **Justification:** "Appendix M" 2012 IRC Amendments is now "Appendix Q" 2015 IRC Amendments.
SECTION AM601 **ROOF/CEILING ASSEMBLIES** **AM601.1 General.** Roof/ceiling assemblies shall be constructed in accordance with the requirements of AM601.2 or AM601.3 **Exception:** Roof/ceiling assemblies or materials that have been tested or listed with a minimum STC rating of 40. **AM601.2 Ceilings with unconditioned attic space above.** Ceilings with unconditioned attic space shall be insulated with a minimum of ½ inch gypsum drywall on the interior ceiling side covered with a minimum of 12 inches of blown in fiberglass insulation. **AM601.3 Ceilings without attic space above.** Ceilings without attic space above shall be insulated with a minimum of ⅝ inch gypsum drywall on the interior side filled with a minimum of 9 inches of fiberglass batt insulation with a 1-inch air space between the roof sheathing and the fiberglass.	**SECTION AQ601** **ROOF/CEILING ASSEMBLIES** **AQ601.1 General.** Roof/ceiling assemblies shall be constructed in accordance with the requirements of AQ601.2 or AQ601.3. **Exception:** Roof/ceiling assemblies or materials that have been tested or *listed* with a minimum STC rating of 40 need not be constructed in accordance with the requirements of AQ601.2 or AQ601.3. **AQ601.2 Ceilings with unconditioned attic space above.** Ceilings with unconditioned attic space shall be insulated with a minimum of ½ inch gypsum drywall on the interior ceiling side covered with a minimum of 12 inches of blown in fiberglass insulation. **AQ601.3 Ceilings without attic space above.** Ceilings without attic space above shall be insulated with a minimum of 5/8 inch gypsum drywall on the interior side filled with a minimum of 9 inches of fiberglass batt insulation with a 1-inch air space between the roof sheathing and the fiberglass.	***City of Houston Amendment*** **Analysis:** Previous IRC 2012 "Appendix M" COH Amendments have been relocated to IRC 2015 "Appendix Q" as a COH Amendment. Minor editorial changes included for clarity. ***No change to the previous code requirements or code intent.*** **Justification:** "Appendix M" 2012 IRC Amendments is now "Appendix Q" 2015 IRC Amendments.
2012 Houston IRC – Appendix T (A, B, C, H, L, M and V)	**2015 Houston IRC – Appendix T (A, B, C, H, K, L, M, Q, T, U, and V)**	**Code Analysis**
N/A	**APPENDIX T** ~~**RECOMMENDED PROCEDURE FOR WORST CASE TESTING OF ATMOSPHERIC VENTINGS SYSTEMS UNDER N1102.4 OR N1105 CONDITIONS ≤5 ACH$_{50}$**~~ {**EDITORIAL NOTE:** DELETE ENTIRE APPENDIX AND REPLACE WITH THE FOLLOWING.} **TINY HOUSES**	***City of Houston Amendment*** **Analysis:** Appendix T was replaced with the proposed language for the "Tiny Houses" appendix from the IRC 2018 Edition. **Justification:** See proposed language for the "Tiny Houses".
N/A	***User note:*** *Appendix T relaxes various requirements in the body of this code as they apply to houses that are 400 square feet in area or less. Attention is specifically paid to features such as stairs, including stair handrails and headroom, ladders, reduced heights in lofts, and guard and emergency escape and rescue opening requirements at lofts.*	***City of Houston Amendment*** **Analysis:** Appendix T was replaced with the proposed language for the "Tiny Houses" appendix from the IRC 2018 Edition. **Justification:** See proposed language for the "Tiny Houses".

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N/A	**SECTION AT101** **GENERAL** **AT101.1 Scope.** This appendix shall be applicable to *tiny houses* used as single *dwelling units*. *Tiny houses* shall comply with this code except as otherwise stated in this appendix.	***City of Houston Amendment*** **Analysis:** Appendix T was replaced with the proposed language for the "Tiny Houses" appendix from the IRC 2018 Edition. **Justification:** See proposed language for the "Tiny Houses".
N/A	**SECTION AT102** **DEFINITIONS** **AT102.1 General.** The following words and terms shall, for the purposes of this appendix, have the meanings shown herein. Refer to Chapter 2 of this code for general definitions. **EGRESS ROOF ACCESS WINDOW.** A *skylight* or roof window designed and installed to satisfy the emergency escape and rescue opening requirements in Section R310.2. **LANDING PLATFORM.** A landing provided as the top step of a stairway accessing a *loft*. **LOFT.** A floor level located more than 30 inches (762 mm) above the main floor, open to the main floor on one or more sides, with a ceiling height of less than 6 feet 8 inches (2,032 mm) and used as a living or sleeping space. **TINY HOUSE.** A *dwelling* that is 400 square feet (37 m²) or less in floor area excluding *lofts*.	***City of Houston Amendment*** **Analysis:** Appendix T was replaced with the proposed language for the "Tiny Houses" appendix from the IRC 2018 Edition. **Justification:** See proposed language for the "Tiny Houses".
N/A	**SECTION AT103** **CEILING HEIGHT** **AT103.1 Minimum ceiling height.** *Habitable space* and hallways in *tiny houses* shall have a ceiling height of not less than 6 feet 8 inches (2,032 mm). Bathrooms, toilet rooms, and kitchens shall have a ceiling height of not less than 6 feet 4 inches (1,930 mm). Obstructions including, but not limited to, beams, girders, ducts, and lighting, shall not extend below these minimum ceiling heights. **Exception:** Ceiling heights in *lofts* are permitted to be less than 6 feet 8 inches (2,032 mm).	***City of Houston Amendment*** **Analysis:** Appendix T was replaced with the proposed language for the "Tiny Houses" appendix from the IRC 2018 Edition. **Justification:** See proposed language for the "Tiny Houses".
N/A	**SECTION AT104** **LOFTS** **AT104.1 Minimum loft area and dimensions.** *A loft* used as a sleeping or living space shall meet the minimum area and dimension requirements of Sections AT104.1.1 through AT104.1.3.	***City of Houston Amendment*** **Analysis:** Appendix T was replaced with the proposed language for the "Tiny Houses" appendix from the IRC 2018 Edition. **Justification:** See proposed language for the "Tiny Houses".
N/A	**AT104.1.1 Minimum area.** *A loft* shall have a floor area of not less than 35 square feet (3.25 m²).	***City of Houston Amendment*** **Analysis:** Appendix T was replaced with the proposed language for the "Tiny Houses" appendix from the IRC 2018 Edition. **Justification:** See proposed language for the "Tiny Houses".
N/A	**AT104.1.2 Minimum dimensions.** *A loft* shall be not less than 5 feet (1,524 mm) in any horizontal dimension.	***City of Houston Amendment*** **Analysis:** Appendix T was replaced with the proposed language for the "Tiny Houses" appendix from the IRC 2018 Edition. **Justification:** See proposed language for the "Tiny Houses".

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N/A	**AT104.1.3 Height effect on loft area.** Portions of a *loft* with a sloping ceiling measuring less than 3 feet (914 mm) from the finished floor to the finished ceiling shall not be considered as contributing to the minimum required area for the *loft*. **Exception:** Portions of a *loft* with a sloped ceiling measuring less than 16 inches (406 mm) from the finished floor to the finished ceiling located under a gable roof with a minimum slope of 6 units vertical in 12 units horizontal (50 percent slope) shall not be considered as contributing to the minimum required area for the *loft*.	***City of Houston Amendment*** **Analysis:** Appendix T was replaced with the proposed language for the "Tiny Houses" appendix from the IRC 2018 Edition. **Justification:** See proposed language for the "Tiny Houses".
N/A	**AT104.2 Loft access.** The access to and primary egress from *lofts* shall be of any type described in Sections AT104.2.1 through AT104.2.4. **AT104.2.1 Stairways.** Stairways accessing *lofts* shall comply with this code or with Sections AT104.2.1.1 through AT104.2.1.5.	***City of Houston Amendment*** **Analysis:** Appendix T was replaced with the proposed language for the "Tiny Houses" appendix from the IRC 2018 Edition. **Justification:** See proposed language for the "Tiny Houses".
N/A	**AT104.2.1.1 Width.** Stairways accessing a *loft* shall not be less than 17 inches (432 mm) in clear width at or above the handrail. The width below the handrail shall be not less than 20 inches (508 mm).	***City of Houston Amendment*** **Analysis:** Appendix T was replaced with the proposed language for the "Tiny Houses" appendix from the IRC 2018 Edition. **Justification:** See proposed language for the "Tiny Houses".
N/A	**AT104.2.1.2 Headroom.** The headroom in stairways accessing a *loft* shall be not less than 6 feet 2 inches (1,880 mm), as measured vertically, from a sloped line connecting the tread or landing platform nosing's in the middle of their width.	***City of Houston Amendment*** **Analysis:** Appendix T was replaced with the proposed language for the "Tiny Houses" appendix from the IRC 2018 Edition. **Justification:** See proposed language for the "Tiny Houses".
N/A	**AT104.2.1.3 Treads and risers.** Risers for stairs accessing a *loft* shall not be less than 7 inches (178 mm) and not more than 12 inches (305 mm) in height. Tread depth and riser height shall be calculated in accordance with one of the following formulas: **1.** The tread depth shall be 20 inches (508 mm) minus 4/3rds of the riser height. **2.** The riser height shall be 15 inches (381 mm) minus three-fourths of the tread depth.	***City of Houston Amendment*** **Analysis:** Appendix T was replaced with the proposed language for the "Tiny Houses" appendix from the IRC 2018 Edition. **Justification:** See proposed language for the "Tiny Houses".
N/A	**AT104.2.1.4 Landing platforms.** The top tread and riser of stairways accessing *lofts* shall be constructed as a *landing platform* where the *loft* ceiling height is less than 6 feet 2 inches (1,880 mm) where the stairway meets the *loft*. The *landing platform* shall be 18 inches to 22 inches (457 to 559 mm) in depth measured from the nosing of the *landing platform* to the edge of *loft*, and 16 to 18 inches (406 to 457 mm) in height measured from the *landing platform* to the *loft* floor.	***City of Houston Amendment*** **Analysis:** Appendix T was replaced with the proposed language for the "Tiny Houses" appendix from the IRC 2018 Edition. **Justification:** See proposed language for the "Tiny Houses".
N/A	**AT104.2.1.5 Handrails.** Handrails shall comply with Section R311.7.8. **AT104.2.1.6 Stairway guards.** Guards at open sides of stairways shall comply with Section R312.1.	***City of Houston Amendment*** **Analysis:** Appendix T was replaced with the proposed language for the "Tiny Houses" appendix from the IRC 2018 Edition. **Justification:** See proposed language for the "Tiny Houses".

2012 Houston IRC Amendments	2015 Houston IRC Amendments	Code Change Summary
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N/A	**AT104.2.2 Ladders.** Ladders accessing *lofts* shall comply with Sections AT104.2.2.1 and AT104.2.2.2. **AT104.2.2.1 Size and capacity.** Ladders accessing *lofts* shall have a rung width of not less than 12 inches (305 mm) and 10 inch (254 mm) to 14 inch (356 mm) spacing between rungs. Ladders shall be capable of supporting a 200-pound (75 kg) load on any rung. Rung spacing shall be uniform within 3/8 inch (9.5 mm). **AT104.2.2.2 Incline.** Ladders shall be installed at 70 to 80 degrees from horizontal.	***City of Houston Amendment*** **Analysis:** Appendix T was replaced with the proposed language for the "Tiny Houses" appendix from the IRC 2018 Edition. **Justification:** See proposed language for the "Tiny Houses".
N/A	**AT104.2.3 Alternating tread devices.** Alternating tread devices accessing *lofts* shall comply with Sections R311.7.11.1 and R311.7.11.2. The clear width at and below the handrails shall be not less than 20 inches (508 mm).	***City of Houston Amendment*** **Analysis:** Appendix T was replaced with the proposed language for the "Tiny Houses" appendix from the IRC 2018 Edition. **Justification:** See proposed language for the "Tiny Houses".
N/A	**AT104.2.4 Ships ladders.** Ships ladders accessing *lofts* shall comply with Sections R311.7.12.1 and R311.7.12.2. The clear width at and below handrails shall be not less than 20 inches (508 mm).	***City of Houston Amendment*** **Analysis:** Appendix T was replaced with the proposed language for the "Tiny Houses" appendix from the IRC 2018 Edition. **Justification:** See proposed language for the "Tiny Houses".
N/A	**AT104.2.5 Loft guards.** *Loft* guards shall be located along the open side of *lofts*. *Loft* guards shall be not less than 36 inches (914 mm) in height or one-half of the clear height to the ceiling, whichever is less.	***City of Houston Amendment*** **Analysis:** Appendix T was replaced with the proposed language for the "Tiny Houses" appendix from the IRC 2018 Edition. **Justification:** See proposed language for the "Tiny Houses".
N/A	**SECTION AT105** **EMERGENCY ESCAPE AND RESCUE OPENINGS** **AT105.1 General.** *Tiny houses* shall meet the requirements of Section R310 for emergency escape and rescue openings. **Exception:** *Egress roof access windows* in *lofts* used as sleeping rooms *shall* be deemed to meet the requirements of Section R310 where installed such that the bottom of the opening is not more than 44 inches (1,118 mm) above the *loft* floor, provided the *egress roof access window* complies with the minimum opening area requirements of Section R310.2.1.	***City of Houston Amendment*** **Analysis:** Appendix T was replaced with the proposed language for the "Tiny Houses" appendix from the IRC 2018 Edition. **Justification:** See proposed language for the "Tiny Houses".
2012 Houston IRC – Appendix U (A, B, C, H, L, M and V)	**2015 Houston IRC – Appendix U (A, B, C, H, K, L, M, Q, T, U, and V)**	**Code Analysis**
N/A	**APPENDIX U** **SOLAR-READY PROVISIONS—DETACHED ONE-AND TWO-FAMILY DWELLINGS, MULTIPLE SINGLE-FAMILY DWELLINGS (TOWNHOUSES)** *(The provisions contained in this appendix are ~~not~~ mandatory ~~unless specifically referenced in the adopting ordinance~~.)*	***City of Houston Amendment*** **Analysis:** A COH amendment was added. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is necessary to ensure correlation with the 2015 IECC.
N/A	**U103.6 Interconnection pathway.** ~~Construction documents shall indicate pathways for routing of conduit or plumbing from the solar ready *zone* to the electrical service panel or service hot water system.~~ Conduit not less than 1¼ inches (31.75 mm) shall be installed to provide a pathway from the electrical panel to the underside of the roof sufficient to allow future installation of solar equipment. **Exception:** Section U103.6 shall not apply to new single-family homes subject to discount in the *Building Code* based on valuation.	***City of Houston Amendment*** **Analysis:** A COH amendment was added. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is necessary to ensure correlation with the 2015 IECC.

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	{**EDITORIAL NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2015 IRC.}	
2012 Houston IRC – Appendix V VISITABILITY (A, B, C, H, L, M and V)	**2015 Houston IRC – Appendix V VISITABILITY (A, B, C, H, K, L, M, Q, T, U, and V)**	**Code Analysis**
APPENDIX V **VISITABILITY**	**APPENDIX V** **VISITABILITY**	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
SECTION AV101 **SCOPE** **AV101.1 Purpose.** This set of standards is intended to provide minimum residential features to allow a mobility-impaired person to visit and use a home by providing: **1.** One zero-step entrance at grade-level from the street, a driveway, garage, or an alley connecting to a 36-inch-wide door. **2.** Doors to kitchens, family rooms, living rooms, dining rooms and hallways on the ground level that are wide enough for wheelchair use. **3.** At least one bathroom or half bath on ground level with sufficient room to allow a wheelchair to enter into the bathroom. **Exception:** Where the grade-level floor plan does not include habitable rooms. **AV101.2 Application.** Unless compliance is required by another law or regulation outside this code, compliance with this chapter is voluntary. Any owner who desires to comply with this chapter shall so advise the *building official* when the plans for the residence are filed, so that conformity with this chapter may be considered in the plan review and inspection process.	**SECTION AV101** **SCOPE** **AV101.1 Purpose.** This set of standards is intended to provide minimum residential features to allow a mobility-impaired person to visit and use a home by providing: **1.** One zero-step entrance at grade-level from the street, a driveway, garage, or an alley connecting to a 36 inch (914.4 mm) wide door. **2.** Doors to kitchens, family rooms, living rooms, dining rooms and hallways on the ground level that are wide enough for wheelchair use. **3.** At least one bathroom or half bath on ground level with sufficient room to allow a wheelchair to enter into the bathroom. **Exception:** Where the grade-level floor plan does not include habitable rooms. **AV101.2 Application.** Unless compliance is required by another law or regulation outside this code, compliance with this chapter is voluntary. Any owner who desires to comply with this chapter shall so advise the *building official* when the plans for the residence are filed, so that conformity with this chapter may be considered in the plan review and inspection process.	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
SECTION AV102 **ZERO STEP ENTRANCE** **AV102.1 Route.** A 36-inch-wide *accessible* route to the residence shall be provided by a smooth uninterrupted surface with slope not to exceed 1:12. **AV102.2 Ramp slope and rise.** The least possible slope shall be used for any ramp. The maximum slope of a ramp in new construction shall be 1:12. The maximum rise for any run shall be 30 inches (760 mm). **AV102.3 Special technical provisions for ramps.** Curb ramps and interior or exterior ramps to be constructed on sites where space limitations prohibit the use of a 1:12 slope or less may have slopes and rises as follows: **1.** A slope between 1:10 and 1:12 is allowed for a maximum rise of 6 inches. **2.** A slope between 1:8 and 1:10 is allowed for a maximum rise of 3 inches. A slope steeper than 1:8 is not allowed.	**SECTION AV102** **ZERO STEP ENTRANCE** **AV102.1 Route.** A 36-inch-wide *accessible* route to the residence shall be provided by a smooth uninterrupted surface with slope not to exceed 1:12. **AV102.2 Ramp slope and rise.** The least possible slope shall be used for any ramp. The maximum slope of a ramp in new construction shall be 1:12. The maximum rise for any run shall be 30 inches (762 mm). **AV102.3 Special technical provisions for ramps.** Curb ramps and interior or exterior ramps to be constructed on sites where space limitations prohibit the use of a 1:12 slope or less may have slopes and rises as follows: **1.** A slope between 1:10 and 1:12 is allowed for a maximum rise of 6 inches (152.4 mm). **2.** A slope between 1:8 and 1:10 is allowed for a maximum rise of 3 inches (76.2 mm). A slope steeper than 1:8 is not allowed.	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
SECTION AV103 **DOORS** **AV103.1 Clear width.** One exterior doorway that connects with the zero-step entrance, one bathroom doorway, and any kitchen, family room, living room,	**SECTION AV103** **DOORS** **AV103.1 Clear width.** One exterior doorway that connects with the zero-step entrance, one bathroom doorway, and any kitchen, family room, living room,	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.***

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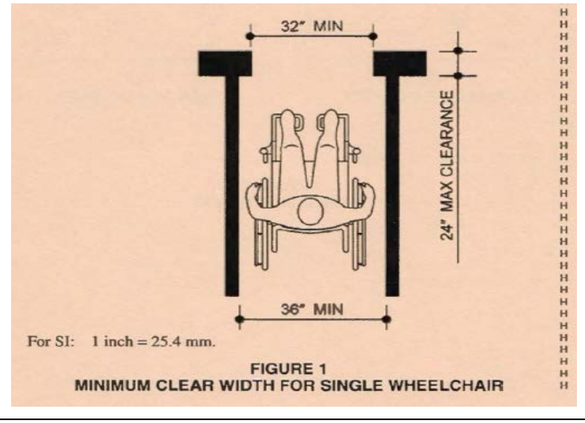
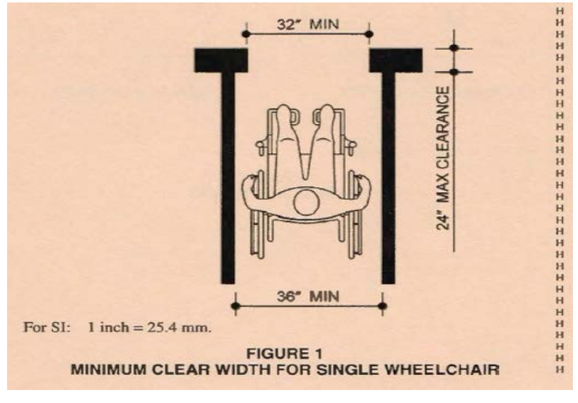
dining room or hallway doorways on grade-level shall have a minimum clear opening of 32 inches (815 mm) with the door open 90 degrees, measured between the face of the door and the opposite stop. Where the door opens more than 90 degrees the clear opening shall be measured between the stops on both sides. **AV103.2 Thresholds at doorways.** Thresholds at doorways shall not exceed ¾ inch (19 mm) in height for exterior sliding doors or ½ inch (13 mm) for other types of doors. Raised thresholds and floor level changes at accessible doorways shall be beveled with a slope no greater than 1:2.	dining room or hallway doorways on grade-level shall have a minimum clear opening of 32 inches (812.8 mm) with the door open 90 degrees, measured between the face of the door and the opposite stop. Where the door opens more than 90 degrees the clear opening shall be measured between the stops on both sides. **AV103.2 Thresholds at doorways.** Thresholds at doorways shall not exceed ¾ inch (19 mm) in height for exterior sliding doors or ½ inch (13 mm) for other types of doors. Raised thresholds and floor level changes at accessible doorways shall be beveled with a slope no greater than 1:2.	**Justification:** This amendment is needed to ensure conformity with state and local government policy.
SECTION AV104 **WHEELCHAIR PASSAGE WIDTH** **AV104.1 Wheelchair passage width.** The minimum clear width for single grade-level wheelchair passage shall be 32 inches (815 mm) at a point not to exceed 24 inches and 36 inches (915 mm) continuously (see Figure 1 and 2). **AV104.2 Changes in level.** Changes in level up to ¼ inch (6 mm) may be vertical and without edge treatment (see Figure 3(a)). Changes in level between ¼ inch and ½ inch (6 mm and 13 mm) shall be beveled with a slope no greater than 1:2 (see Figure 3(b)). Changes in level greater than ½ inch (13 mm) shall be accomplished by means of a ramp that complies with Section AV102.	**SECTION AV104** **WHEELCHAIR PASSAGE WIDTH** **AV104.1 Wheelchair passage width.** The minimum clear width for single grade-level wheelchair passage shall be 32 inches (812.8 mm) at a point not to exceed 24 inches (609.6 mm) and 36 inches (914.4 mm) continuously (see Figure 1 and 2). **AV104.2 Changes in level.** Changes in level up to ¼ inch (6 mm) may be vertical and without edge treatment (see Figure 3(a)). Changes in level between ¼ inch and ½ inch (6 mm and 13 mm, respectively) shall be beveled with a slope no greater than 1:2 (see Figure 3(b)). Changes in level greater than ½ inch (13 mm) shall be accomplished by means of a ramp that complies with Section AV102.	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
 FIGURE 1 MINIMUM CLEAR WIDTH FOR SINGLE WHEELCHAIR	 FIGURE 1 MINIMUM CLEAR WIDTH FOR SINGLE WHEELCHAIR	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.

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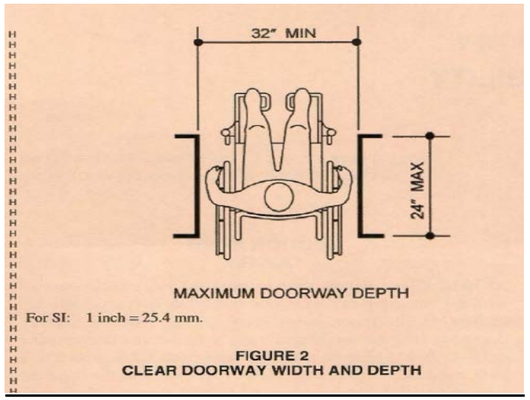
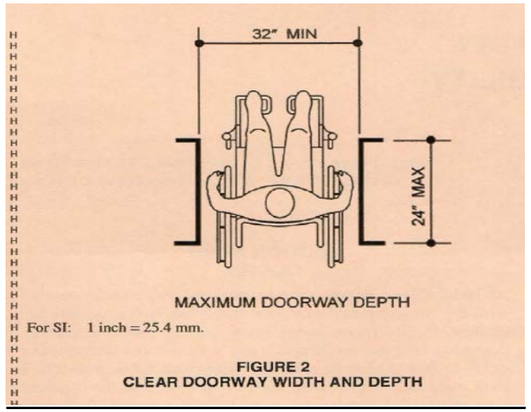
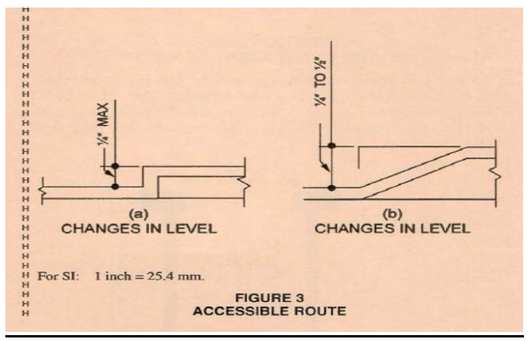
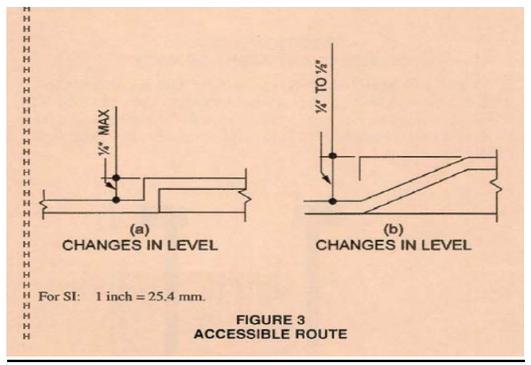
 FIGURE 2 CLEAR DOORWAY WIDTH AND DEPTH	 FIGURE 2 CLEAR DOORWAY WIDTH AND DEPTH	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.
 FIGURE 3 ACCESSIBLE ROUTE	 FIGURE 3 ACCESSIBLE ROUTE	***City of Houston Amendment*** **Analysis:** No changes were made to the COH amendment. ***No change to the previous code requirements or code intent.*** **Justification:** This amendment is needed to ensure conformity with state and local government policy.